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Obuchi

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(54) **OPERATING DEVICE FOR HUMAN-POWERED VEHICLE**

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F15B 15/14 (2006.01)

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CPC ***B62K 23/06*** (2013.01); ***F15B 15/1447*** (2013.01)

(58) **Field of Classification Search**
None
See application file for complete search history.

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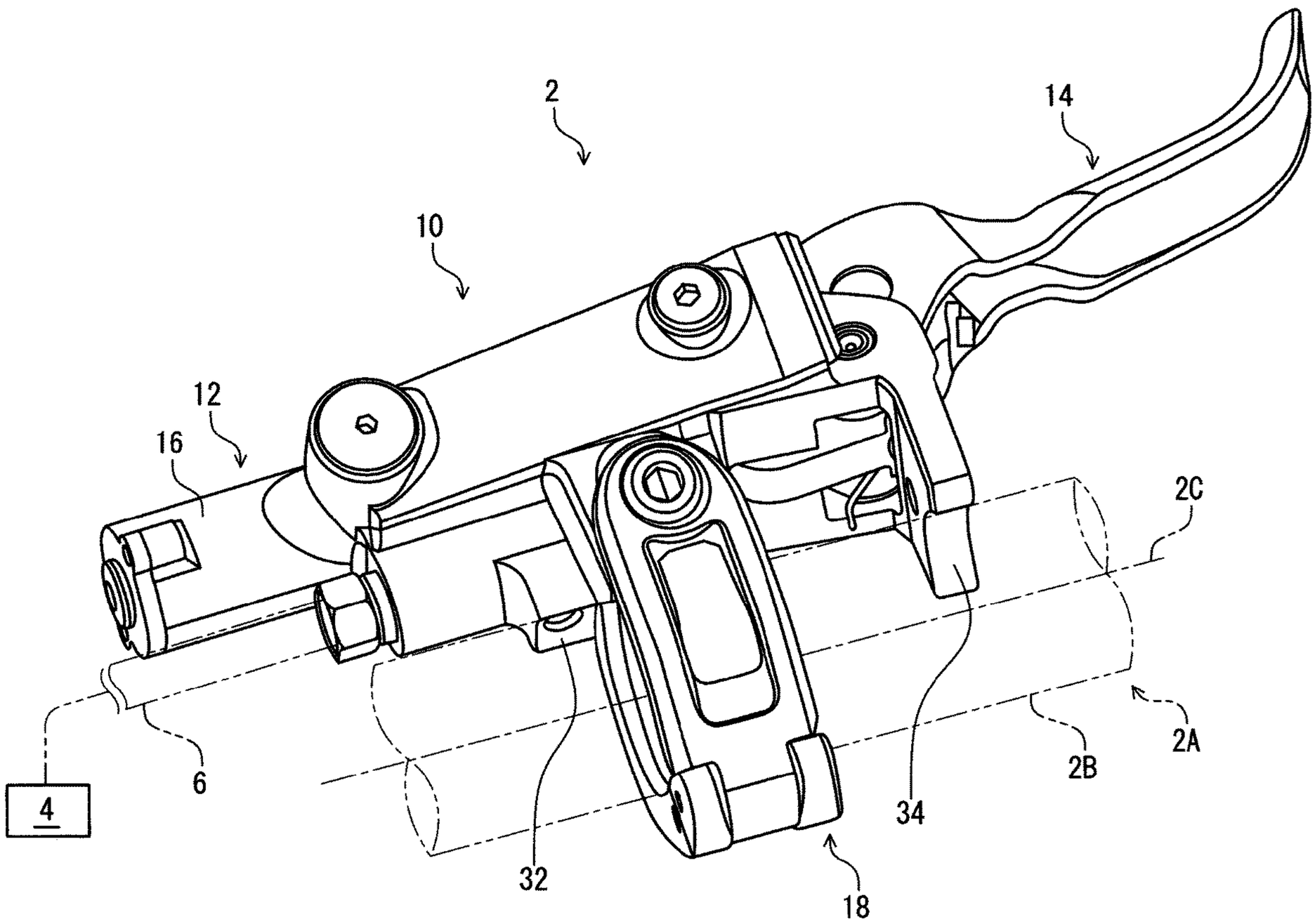
(57) **ABSTRACT**

An operating device comprises a base member and an operating member. The base member includes a base body and a mounting part. The mounting part includes a mounting contact surface contactable with a tubular part of the human-powered vehicle in a mounting state where the mounting part couples the base body to the tubular part of the human-powered vehicle. The base member includes a first contact surface and a second contact surface. The first contact surface is contactable with the tubular part of the human-powered vehicle in the mounting state. The first contact surface is spaced apart from the mounting contact surface in an axial direction. The second contact surface is contactable with the tubular part of the human-powered vehicle in the mounting state. The second contact surface is spaced apart from the mounting contact surface and the first contact surface in the axial direction.

21 Claims, 14 Drawing Sheets



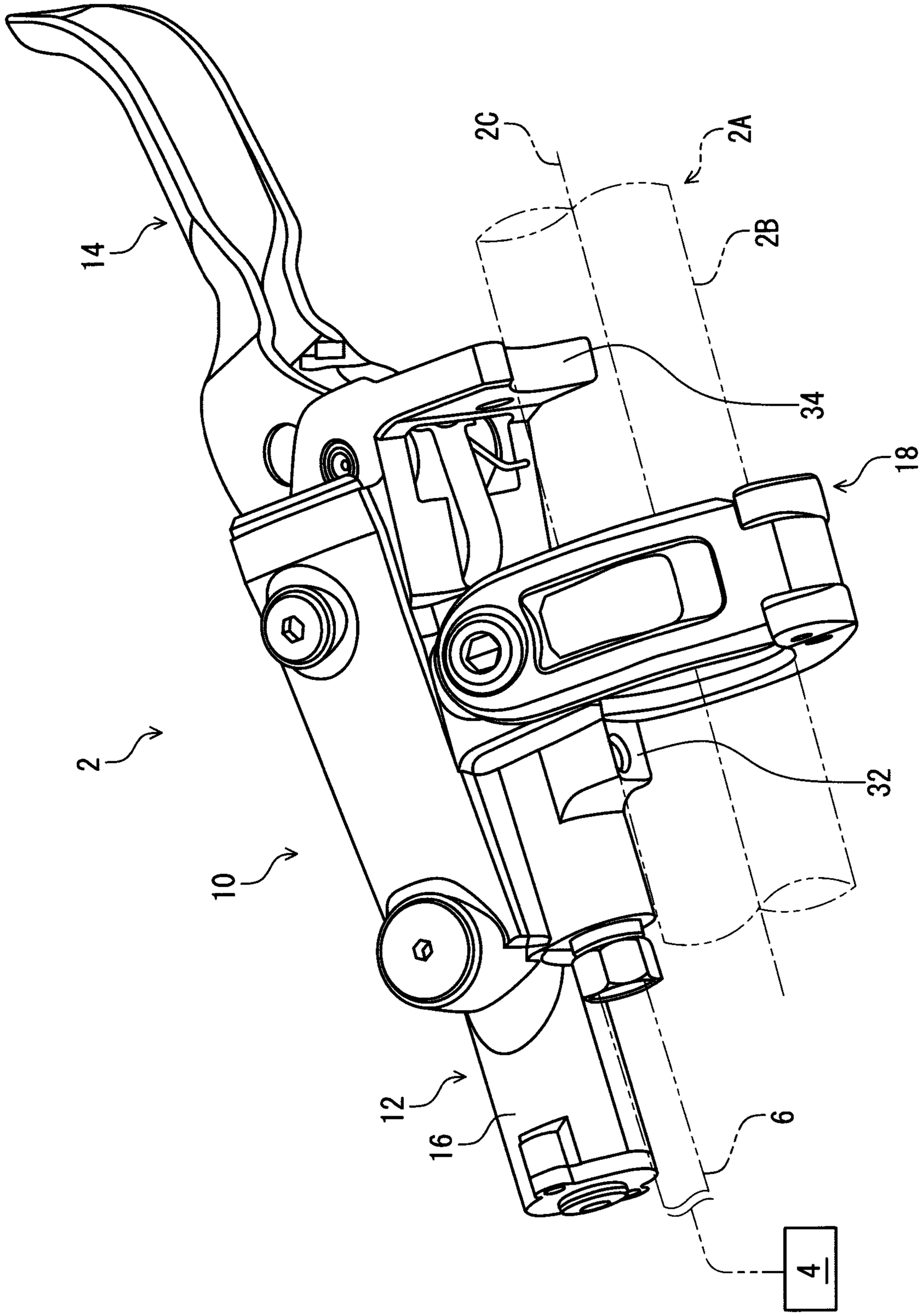
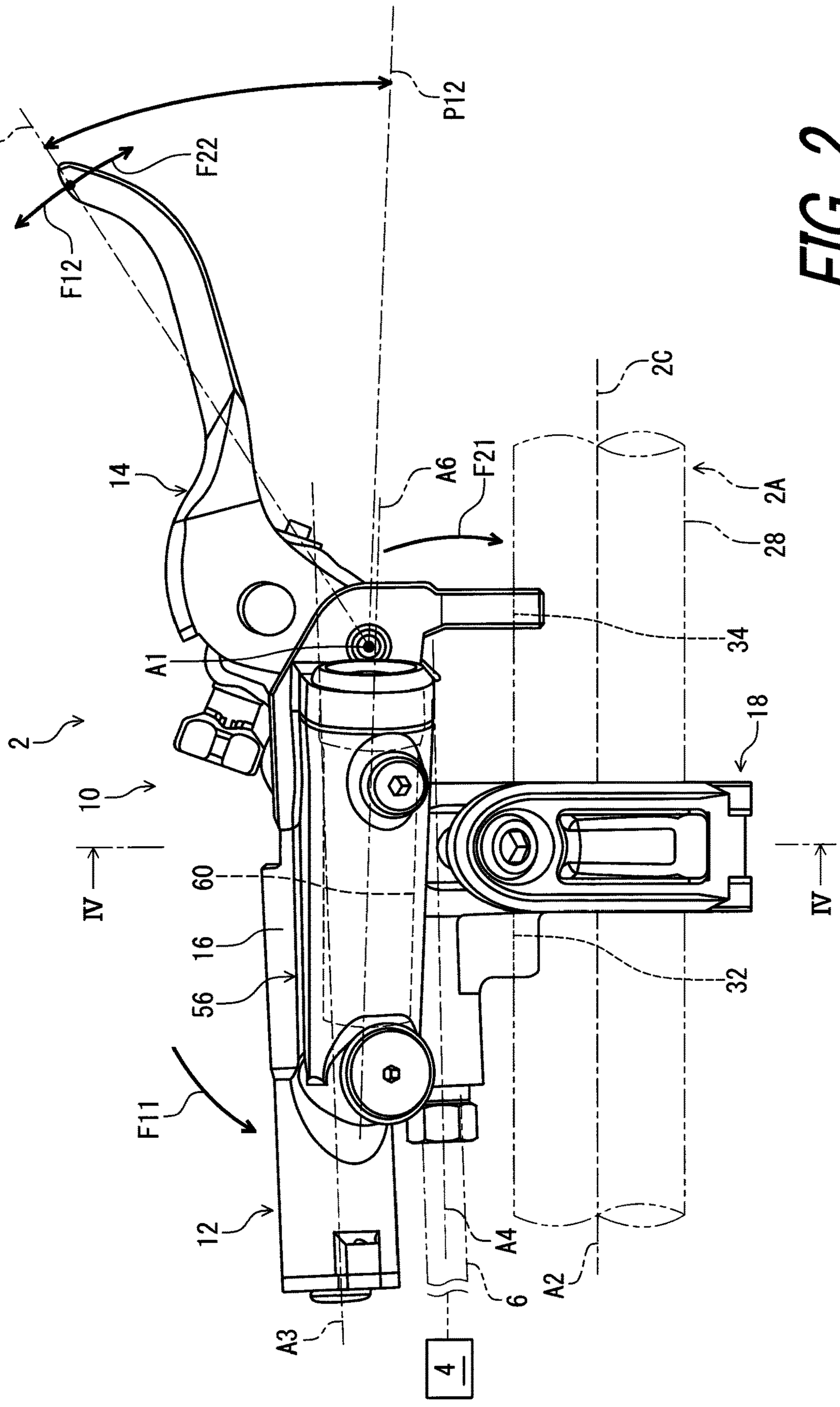


FIG. 1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F12
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A6
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A1
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16
56
32
F11
12
A4
A2
A3
6
4

FIG. 2

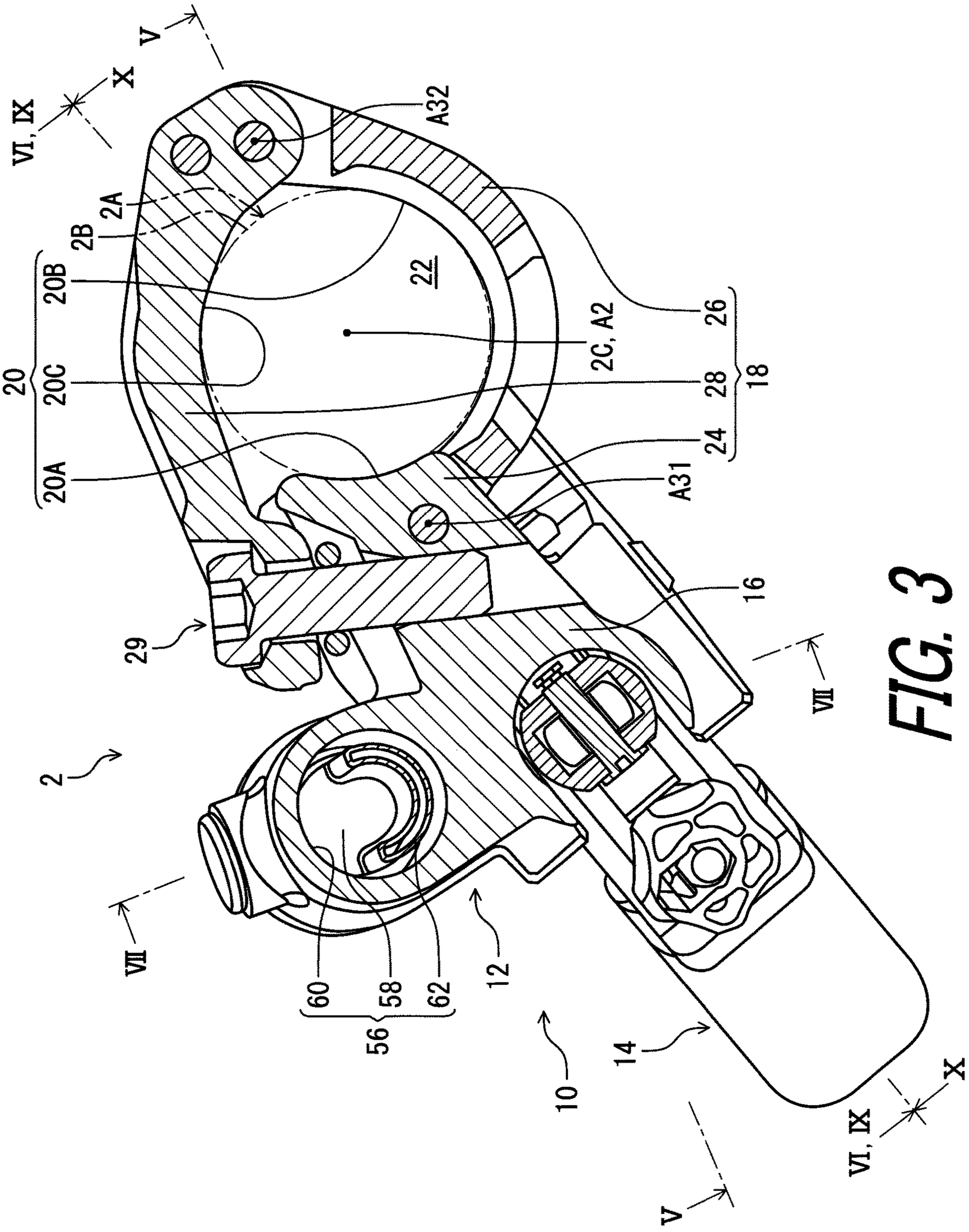

V
X
VI, IX
A32
2A
2B
20B
22
26
20
20C
2C, A2
28
18
20A
24
A31
29
16
2
VII
VII
60
58
62
56
12
10
14
V
VI, IX
X

FIG. 3

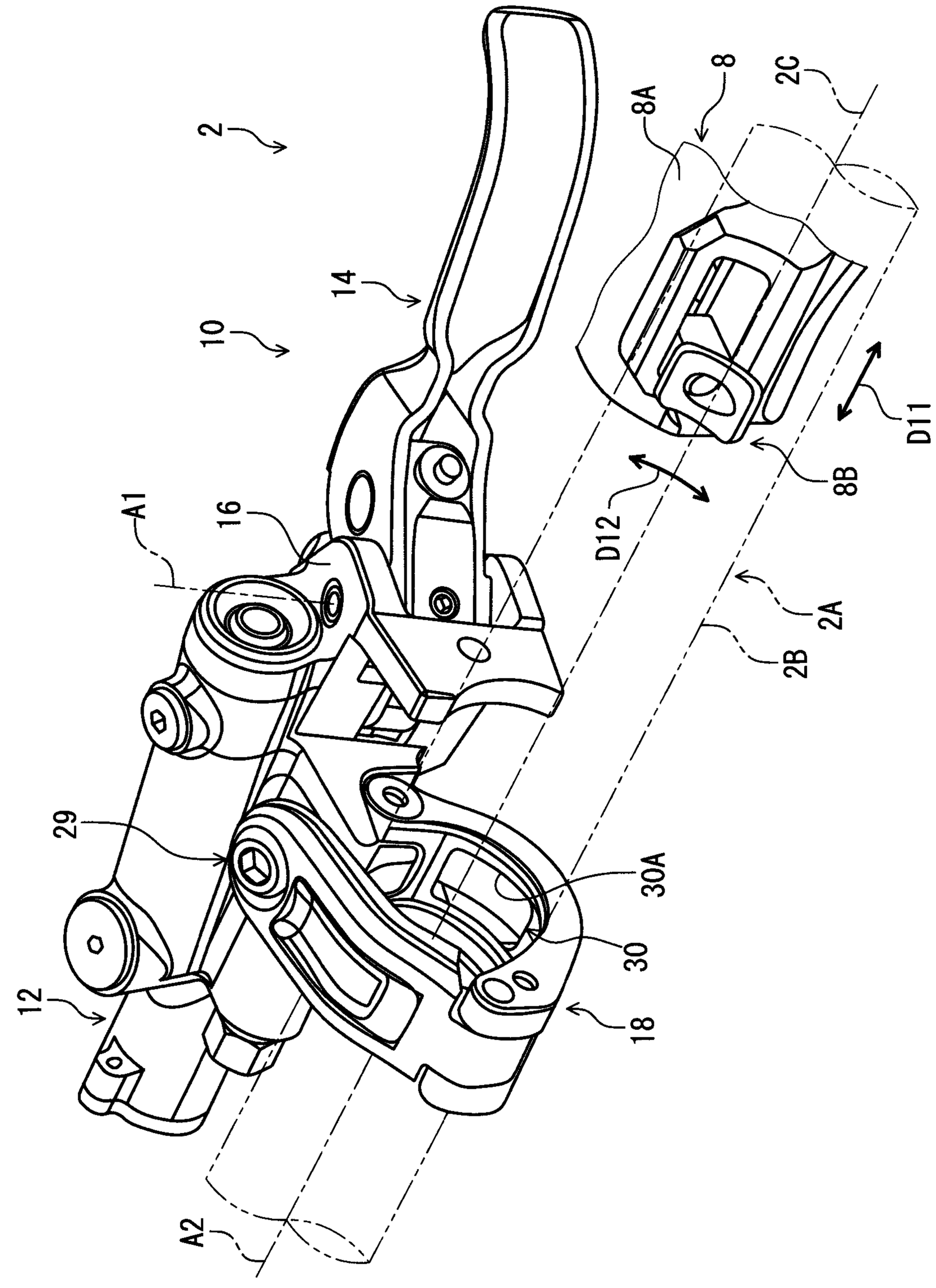
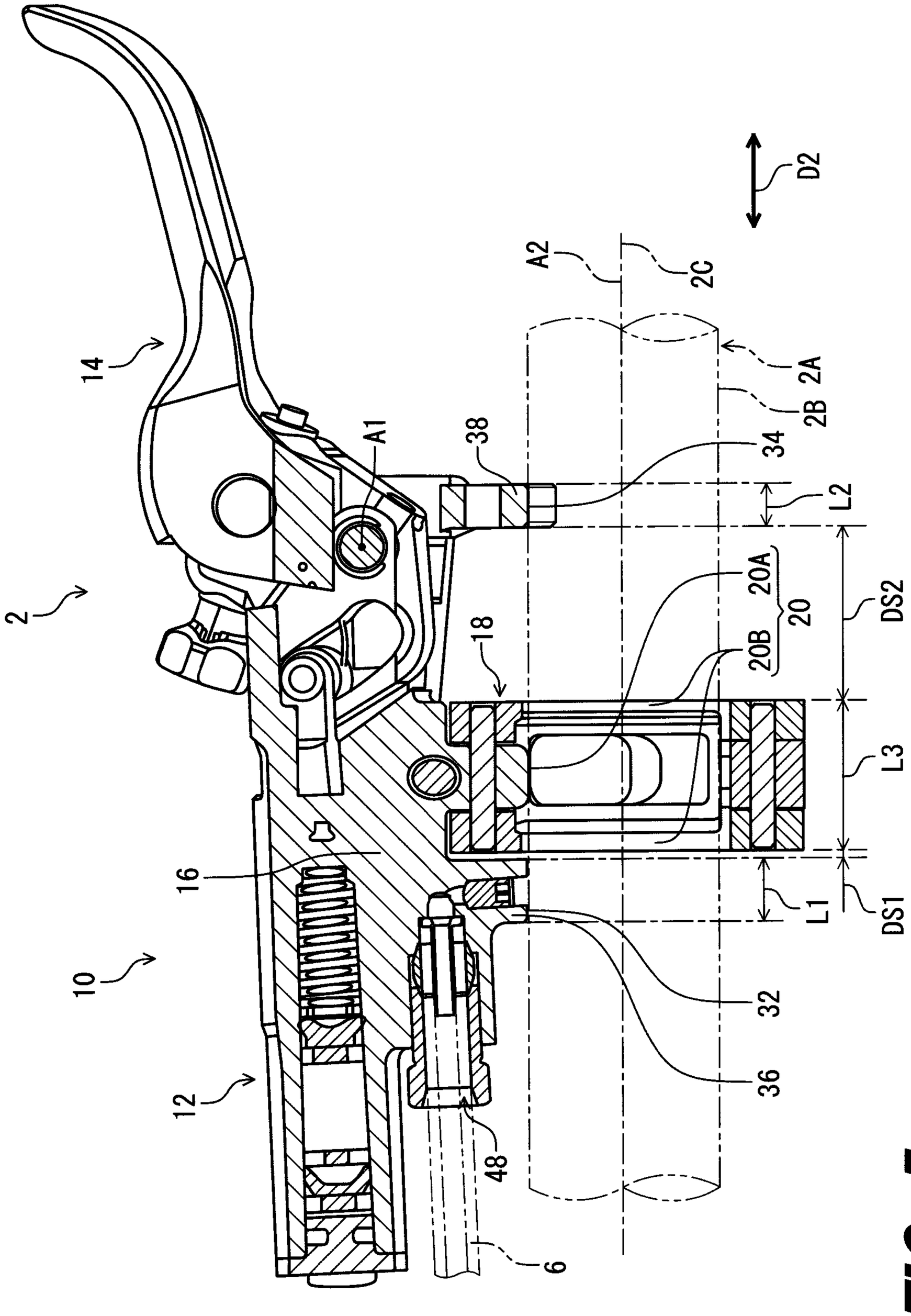


FIG. 4


D2
A2
2C
2A
2B
14
A1
38
34
L2
2
20A
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DS2
L3
16
L1
DS1
10
32
12
36
48
6

FIG. 5

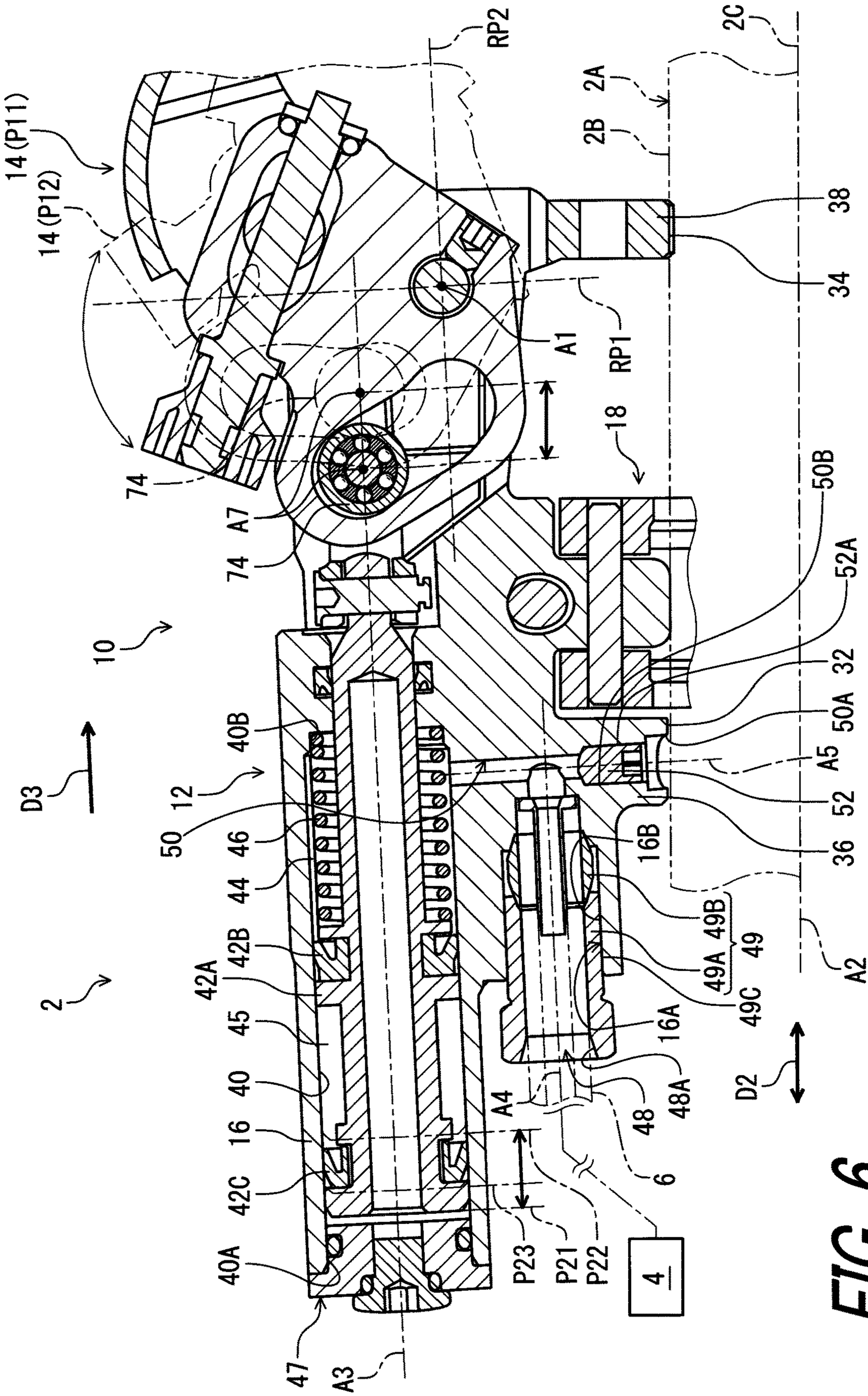
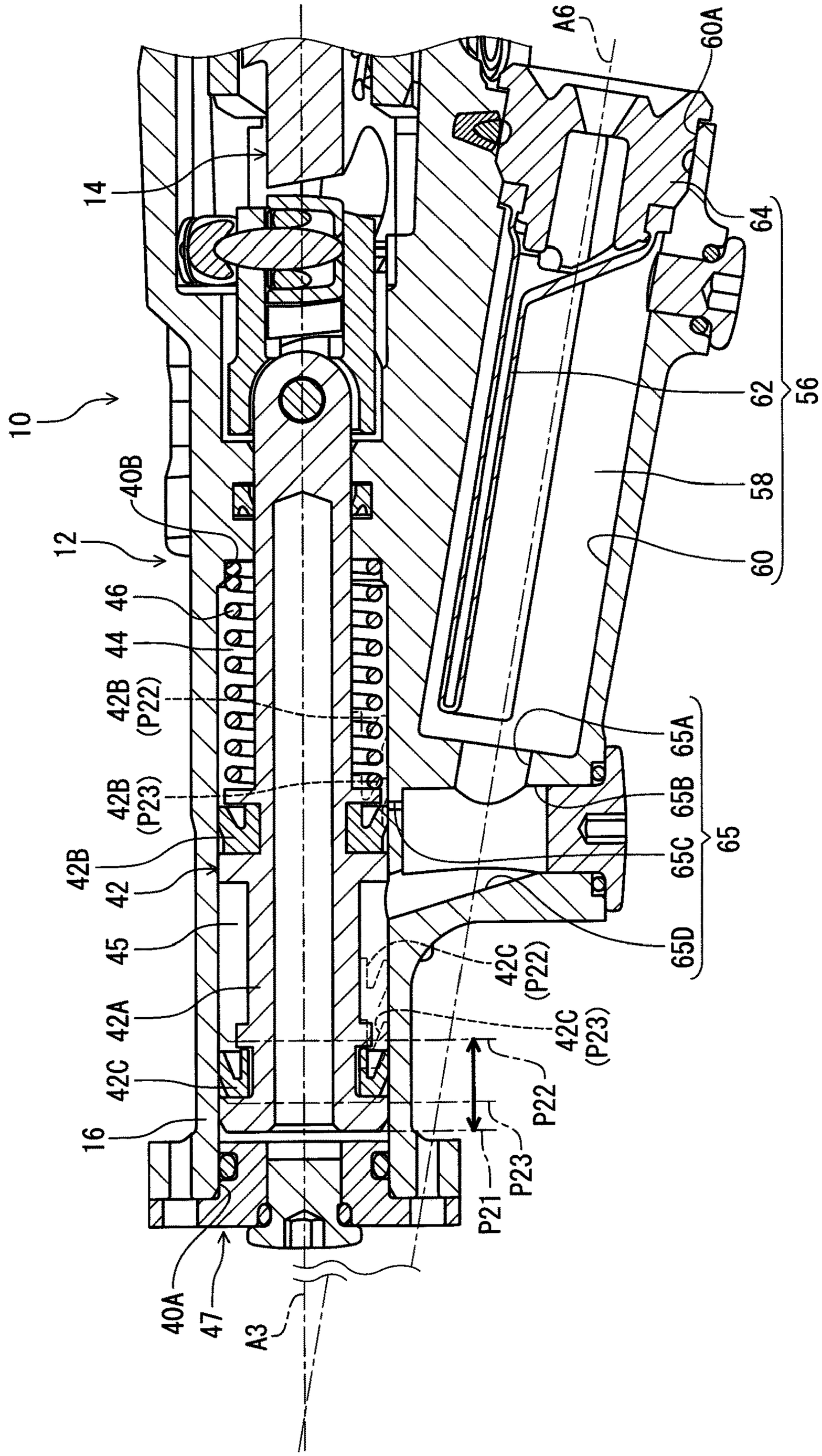

RP2
2C
2A
2B
14 (P11)
14 (P12)
38
34
A1
RP1
18
74
A7
74
50B
52A
10
32
50A
A5
40B
12
D3
50
52
46
16B
36
44
49B
42B
49A
49
42A
49C
A2
45
16A
40
48A
16
48
42C
6
A4
40A
P23
P21
P22
4
47
A3
2

FIG. 6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60A
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46
44
42B
(P22)
42B
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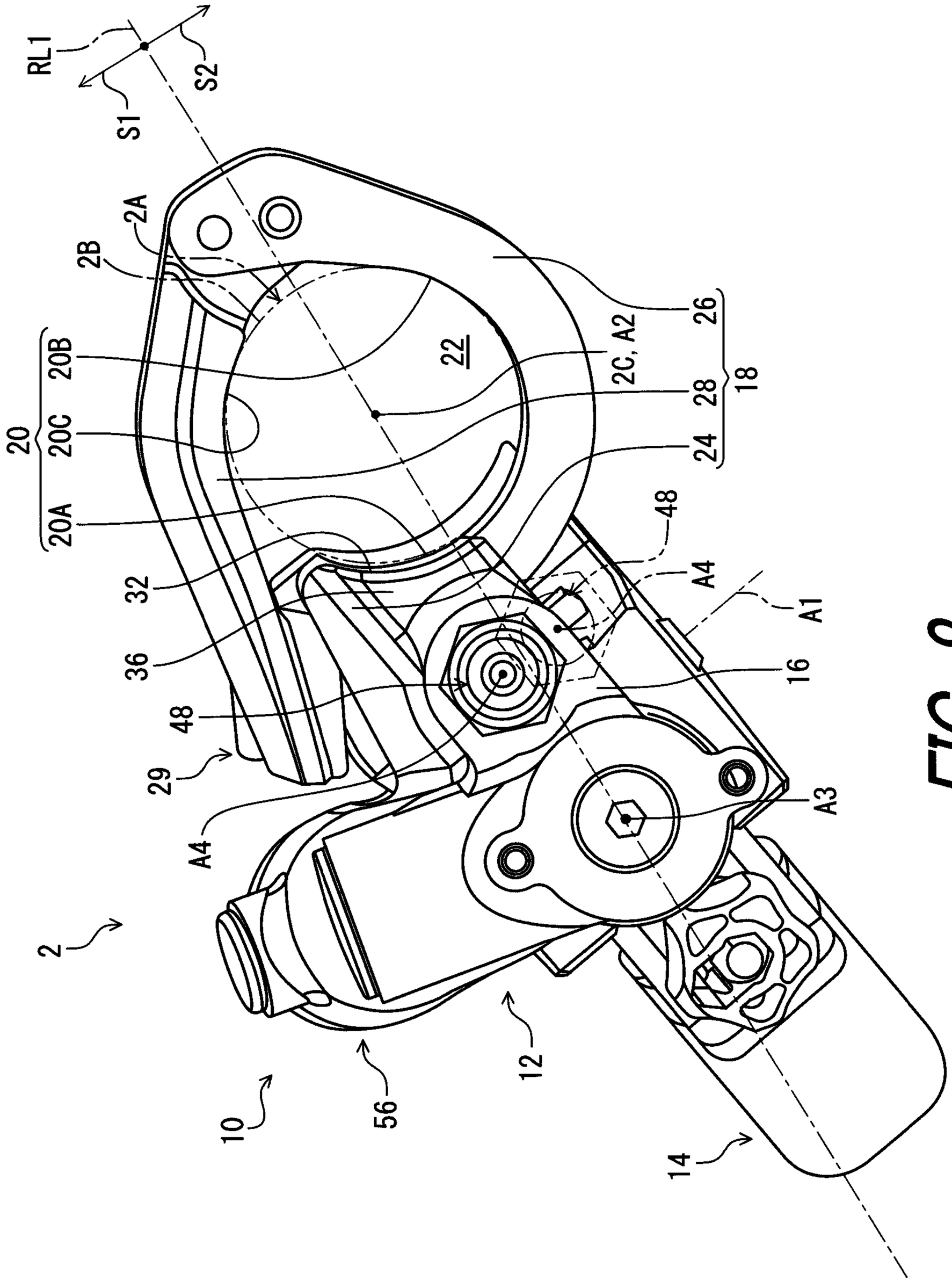
65A
65B
65C
65
42B
42
65D
45
42C
(P22)
42A
42C
(P23)
42C
P22
16
P23
P21
40A
47
A3

FIG. 7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S2
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A4
A1
32
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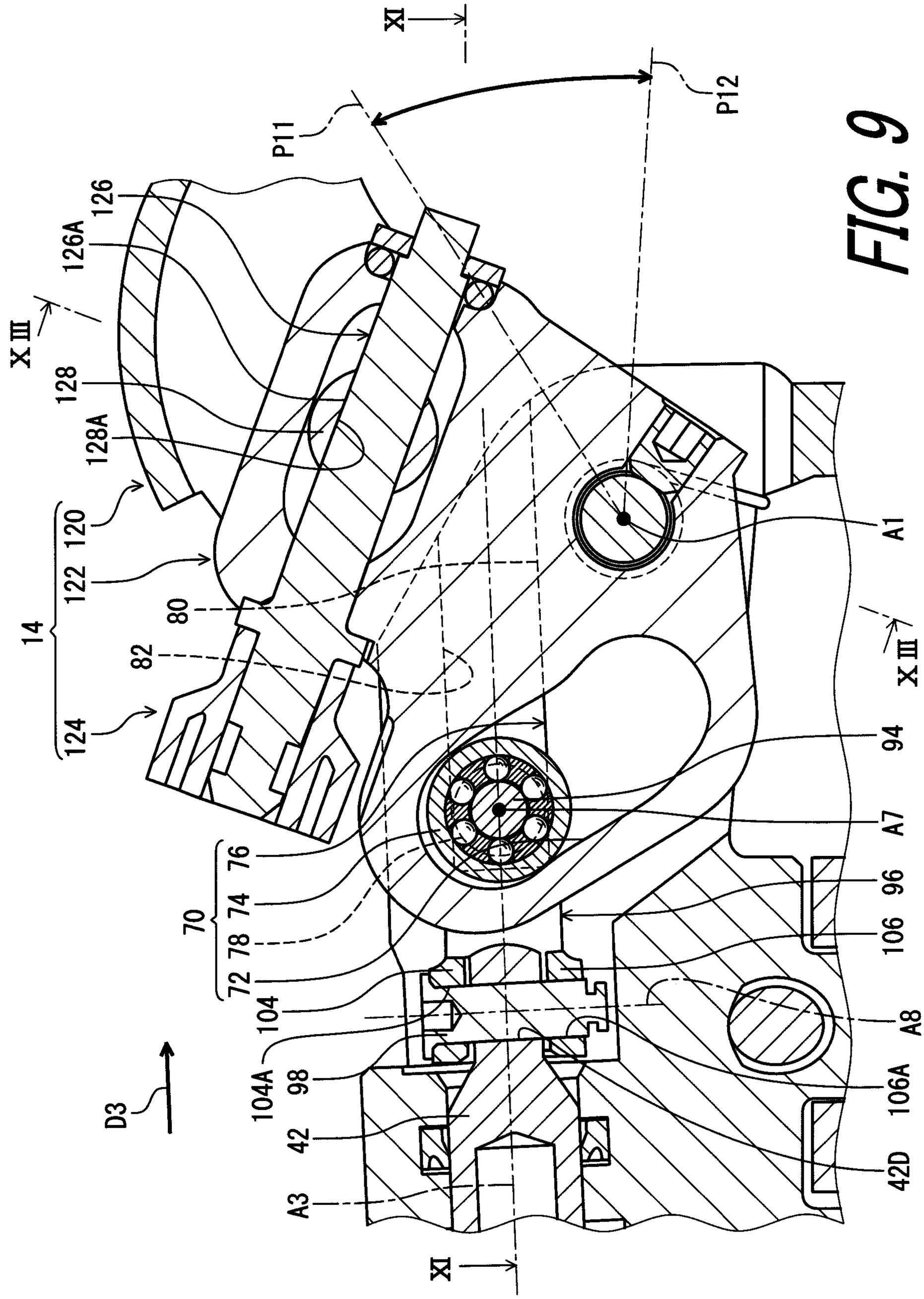
16
48
29
A3
A4
2
10
56
12
14

FIG. 8


XI
P12
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126A
XIII
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120
122
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72
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104A
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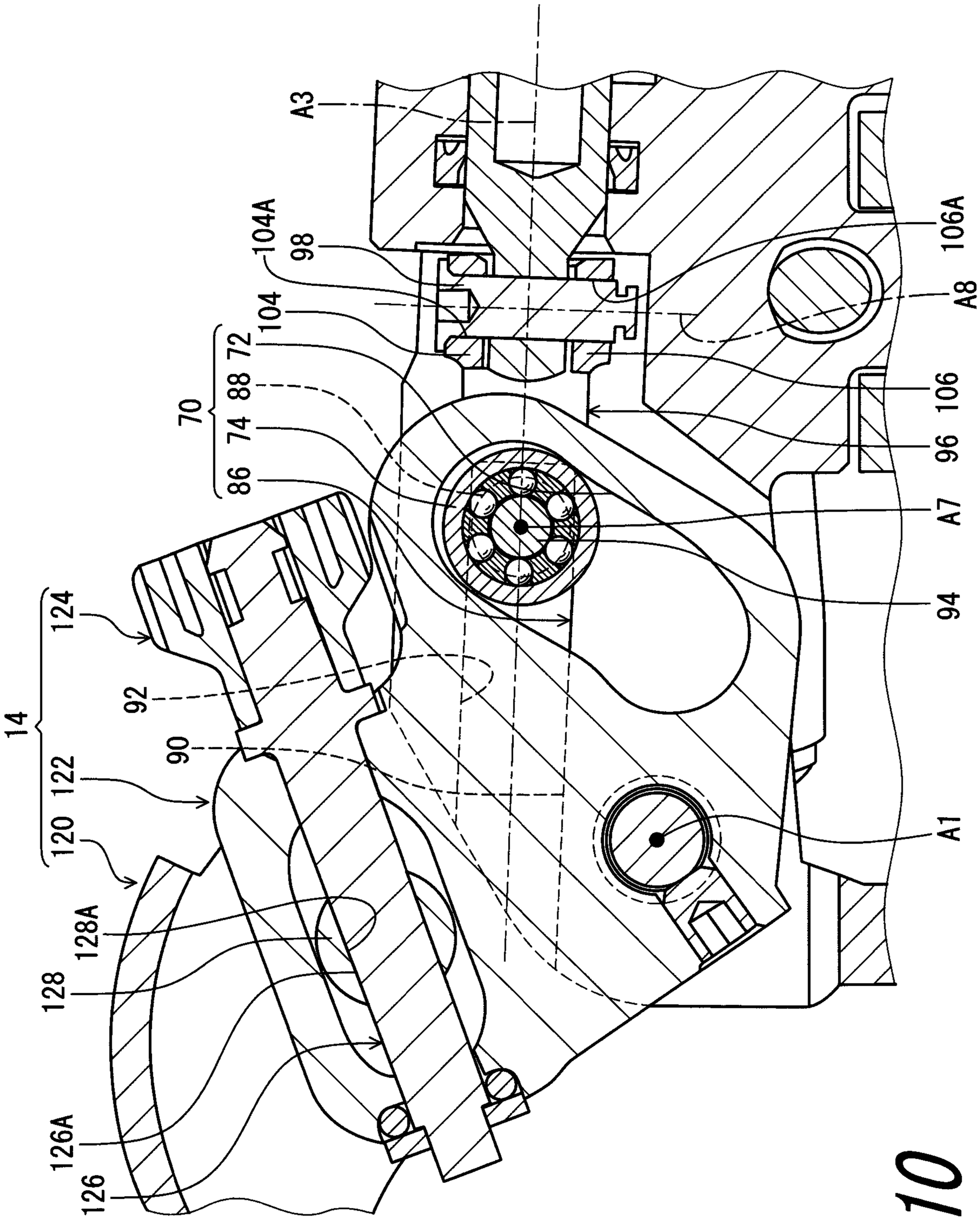
A3
D3
XI
A1
XIII
94
A7
96
106
A8
106A
42D

FIG. 9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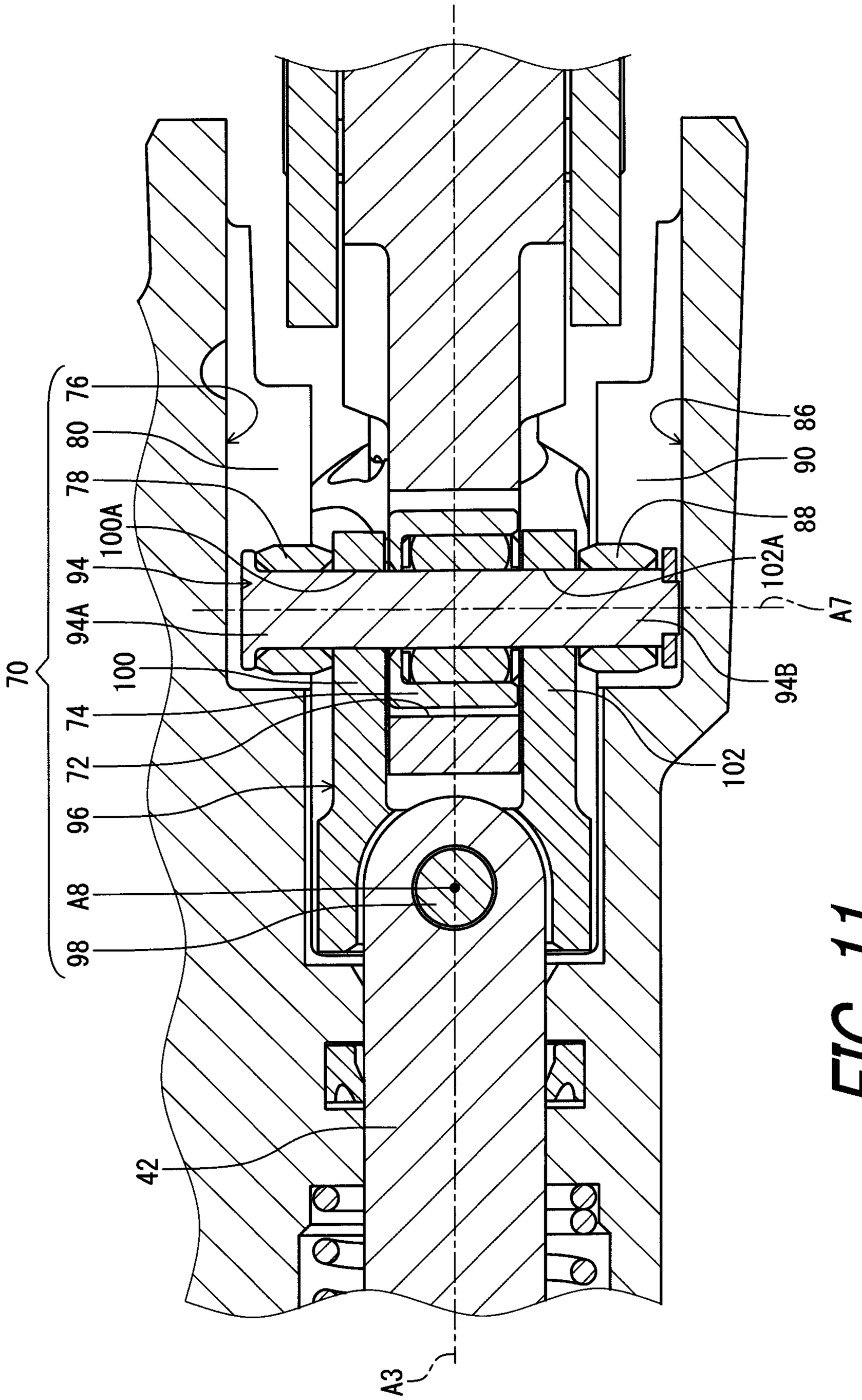
A7
94
A1

FIG. 10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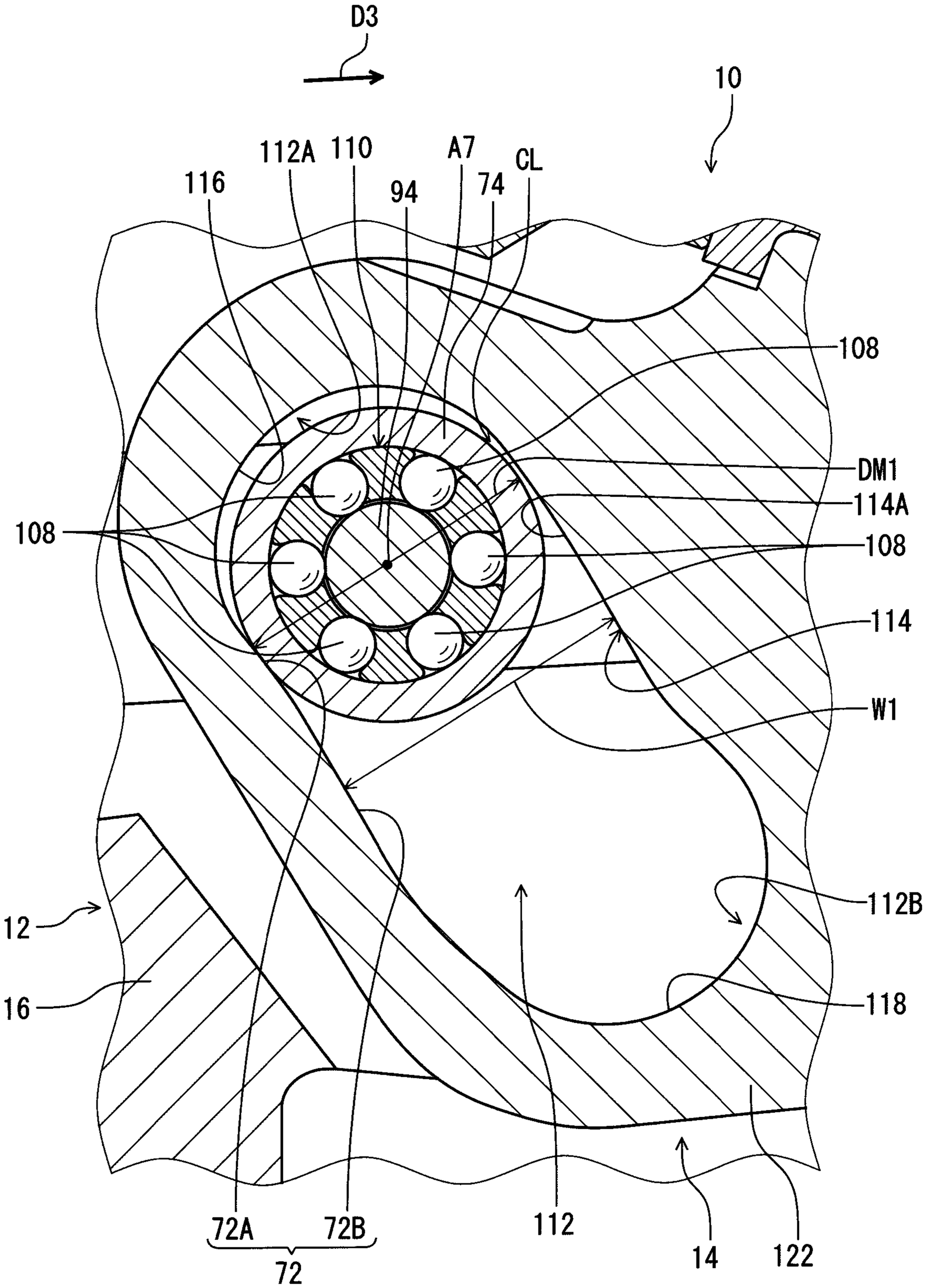
A7
94B
102

FIG. 11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72

FIG. 12

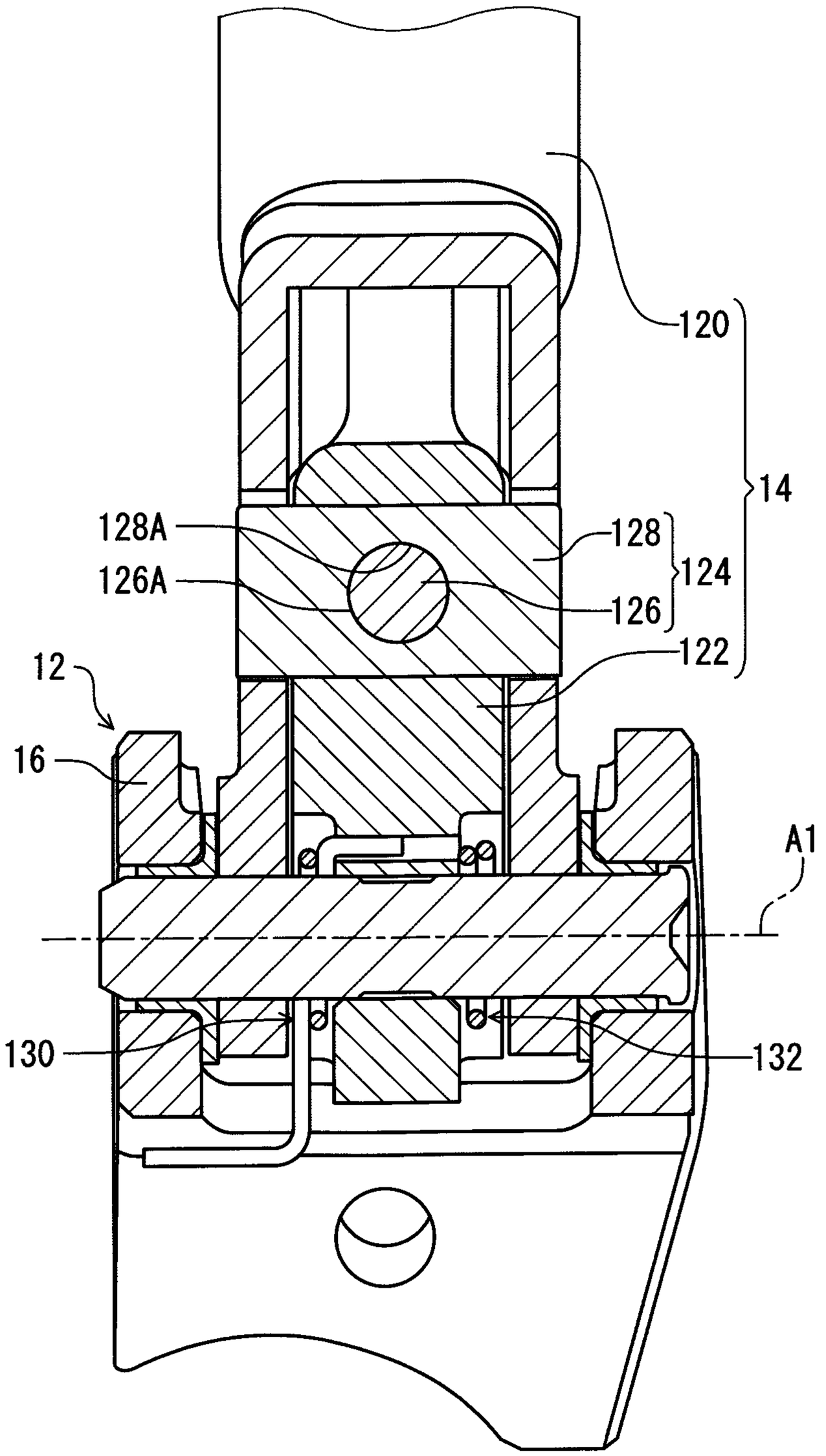

FIG. 13

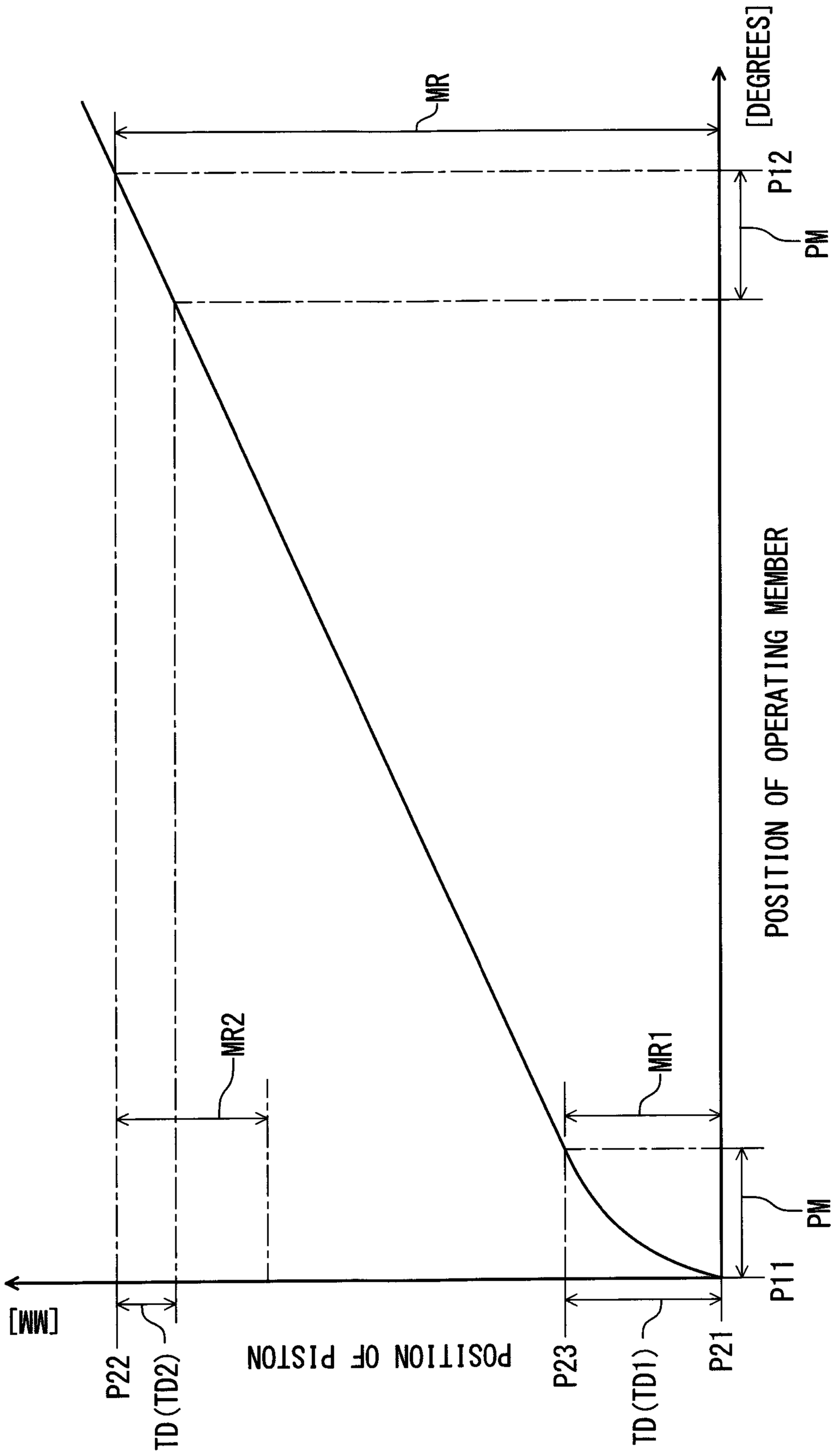
[DEGREES]
MR
P12
PM
POSITION OF OPERATING MEMBER
MR2
MR1
PM
P11
[MM]
P22
TD(TD2)
POSITION OF PISTON
P23
TD(TD1)
P21

FIG. 14

OPERATING DEVICE FOR HUMAN-POWERED VEHICLE

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to an operating device for a human-powered vehicle.

Discussion of the Background

A human-powered vehicle includes an operating apparatus configured to operate an operated apparatus. The operating apparatus includes a base part and an operating part. The operating part is movably coupled to the base part. The operating part is movable relative to the base part in response to a force applied to the operating part from the user. A rotational force may be applied to the base part about a coupling part coupling to the base part to a portion of the human-powered vehicle. It is preferable that rigidity of the operating apparatus is improved. One object of the present disclosure is to provide an operating device having higher rigidity against a force applied to an operating member. Another object of the present disclosure is to efficiently utilize a space around the operating device while improving rigidity of the operating device.

SUMMARY OF THE INVENTION

In accordance with a first aspect of the present invention, an operating device for a human-powered vehicle comprises a base member and an operating member. The base member includes a base body and a mounting part. The mounting part is configured to couple the base body to a tubular part of the human-powered vehicle. At least part of the mounting part is integrally provided with the base body as a one-piece unitary member. The operating member is movably coupled to the base member. The mounting part includes a mounting contact surface contactable with the tubular part of the human-powered vehicle in a mounting state where the mounting part couples the base body to the tubular part of the human-powered vehicle. The mounting part includes a mounting opening having an opening center axis defined along a longitudinal center axis of the tubular part of the human-powered vehicle in the mounting state. The base member includes a first contact surface and a second contact surface. The first contact surface is contactable with the tubular part of the human-powered vehicle in the mounting state. The first contact surface is spaced apart from the mounting contact surface in an axial direction with respect to the opening center axis. The second contact surface is contactable with the tubular part of the human-powered vehicle in the mounting state. The second contact surface is spaced apart from the mounting contact surface and the first contact surface in the axial direction. The mounting contact surface is provided between the first contact surface and the second contact surface in the axial direction.

With the operating device according to the first aspect, the first contact surface can receive a first rotational force about the mounting contact surface when a first force is applied to the operating member. The second contact surface can receive a second rotational force about the mounting contact surface when a second force is applied to the operating member. Thus, the first contact surface and the second contact surface can reduce influence caused by the first and second forces applied to the operating member, improving rigidity of the operating device.

In accordance with a second aspect of the present invention, the operating device according to the first aspect is configured so that the base member includes a cylinder bore and an intermediate hole extending from the cylinder bore toward the first contact surface.

With the operating device according to the second aspect, it is possible to effectively utilizes a portion provided between the cylinder bore and the first contact surface for the intermediate hole while the first contact surface and the second contact surface can reduce influence caused by the forces applied to the operating member, improving rigidity of the operating device.

In accordance with a third aspect of the present invention, an operating device for a human-powered vehicle comprises a base member and an operating member. The base member includes a base body and a mounting part configured to couple the base body to a tubular part of the human-powered vehicle. The operating member is movably coupled to the base member. The mounting part includes a mounting contact surface contactable with the tubular part of the human-powered vehicle in a mounting state where the mounting part couples the base body to the tubular part of the human-powered vehicle. The mounting part includes a mounting opening having an opening center axis defined along a longitudinal center axis of the tubular part of the human-powered vehicle in the mounting state. The base member includes a first contact surface, a cylinder bore, and an intermediate hole. The first contact surface is contactable with the tubular part of the human-powered vehicle in the mounting state. The first contact surface is spaced apart from the mounting contact surface in an axial direction with respect to the opening center axis. The intermediate hole extends from the cylinder bore toward the first contact surface.

With the operating device according to the third aspect, the first contact surface can receive a first rotational force about the mounting contact surface when a first force is applied to the operating member. Thus, the first contact surface can reduce influence caused by the first force applied to the operating member, improving rigidity of the operating device. Furthermore, it is possible to effectively utilizes a portion provided between the cylinder bore and the first contact surface for the intermediate hole.

In accordance with a fourth aspect of the present invention, the operating device according to the first or second aspect is configured so that the base member includes a first support and a second support. The first support includes the first contact surface. The first support extends from the base body toward the tubular part of the human-powered vehicle in the mounting state. The second support includes the second contact surface. The second support extends from the base body toward the tubular part of the human-powered vehicle in the mounting state.

With the operating device according to the fourth aspect, the first contact surface and the second contact surface can receive the first rotational force and the second rotational force while the base body is spaced apart from the tubular part of the human-powered vehicle.

In accordance with a fifth aspect of the present invention, the operating device according to the fourth aspect is configured so that at least one of the first support and the second support is integrally provided with the base body as a one-piece unitary member.

With the operating device according to the fifth aspect, the at least one of the first support and the second support can improve rigidity of the base member.

In accordance with a sixth aspect of the present invention, the operating device according to any one of the first, second, fourth, and fifth aspects is configured so that the first contact surface is closer to the mounting contact surface than the second contact surface in the axial direction.

With the operating device according to the sixth aspect, it is possible to efficiently arrange the first contact surface in a space defined around the mounting contact surface.

In accordance with a seventh aspect of the present invention, the operating device according to any one of the first to sixth aspects is configured so that the operating member is pivotally coupled to the base body about a pivot axis. The mounting contact surface is closer to the pivot axis than the first contact surface in the axial direction.

With the operating device according to the seventh aspect, the first contact surface can reliably receive the first rotational force about the mounting contact surface when the first force applied to the operating member. Thus, the first contact surface can reduce influence caused by the first force applied to the operating member, improving reliably the rigidity of the operating device.

In accordance with an eighth aspect of the present invention, the operating device according to any one of the first to seventh aspects is configured so that the mounting part includes a first mounting portion and a second mounting portion. The first mounting portion is integrally provided with the base body as a one-piece unitary member. The second mounting portion is pivotally coupled to the first mounting portion about a first mounting pivot axis. The mounting contact surface is provided on at least one of the first mounting portion and the second mounting portion.

With the operating device according to the eighth aspect, the second mounting portion enables the mounting part to be easily detachable from and reattachable to the tubular part of the human-powered vehicle.

In accordance with a ninth aspect of the present invention, the operating device according to the eighth aspect is configured so that the mounting part includes a third mounting portion pivotally coupled to the second mounting portion about a second mounting pivot axis. The mounting contact surface is provided to at least one of the first mounting portion, the second mounting portion, and the third mounting portion.

With the operating device according to the ninth aspect, the second mounting portion and the third mounting portion enable the mounting part to be more easily detachable from and reattachable to the tubular part of the human-powered vehicle.

In accordance with a tenth aspect of the present invention, the operating device according to any one of the second to ninth aspects is configured so that the base member includes a first support including the first contact surface. The first support extends from the base body toward the tubular part of the human-powered vehicle in the mounting state. The intermediate hole is at least partially provided in the first support.

With the operating device according to the tenth aspect, it is possible to efficiently utilize the first support for the intermediate hole.

In accordance with an eleventh aspect of the present invention, the operating device according to any one of the second to tenth aspects is configured so that the intermediate hole includes an end opening provided on the first contact surface and extends from the cylinder bore to the end opening.

With the operating device according to the eleventh aspect, it is possible to more efficiently utilize the first support for the intermediate hole.

In accordance with a twelfth aspect of the present invention, the operating device according to the eleventh aspect is configured so that the base member includes a seal member provided in the intermediate hole to close the intermediate hole.

With the operating device according to the twelfth aspect, it is possible to close the intermediate hole while efficiently utilizing the first support for the intermediate hole.

In accordance with a thirteenth aspect of the present invention, the operating device according to the twelfth aspect is configured so that the seal member is provided between the cylinder bore and the end opening.

With the operating device according to the thirteenth aspect, it is possible to reliably avoid interference between the seal member and the tubular part of the human-powered vehicle while the seal member closes the intermediate hole.

In accordance with a fourteenth aspect of the present invention, the operating device according to any one of the second to thirteenth aspects is configured so that the base member includes a hose-attachment hole configured to be detachably connected with a hydraulic hose. The hose-attachment hole is configured to be in communication with the intermediate hole.

With the operating device according to the fourteenth aspect, it is possible to connect the hose-attachment hole to the cylinder bore via the intermediate hole.

In accordance with a fifteenth aspect of the present invention, the operating device according to the fourteenth aspect is configured so that the cylinder bore has a cylinder center axis and extends the cylinder center axis. The hose-attachment hole extends from the intermediate hole along the cylinder center axis.

With the operating device according to the fifteenth aspect, it is possible to efficiently arrange the hose-attachment hole and the intermediate hole.

In accordance with a sixteenth aspect of the present invention, the operating device according to the fourteenth or fifteenth aspect is configured so that the hose-attachment hole extends from the intermediate hole along the axial direction.

With the operating device according to the sixteenth aspect, it is possible to more efficiently arrange the hose-attachment hole and the intermediate hole.

In accordance with a seventeenth aspect of the present invention, the operating device according to any one of the fourteenth to sixteenth aspects is configured so that the hose-attachment hole extends from the intermediate hole away from the mounting contact surface along the axial direction.

With the operating device according to the seventeenth aspect, it is possible to more efficiently arrange the hose-attachment hole and the intermediate hole.

In accordance with an eighteenth aspect of the present invention, the operating device according to any one of the second to seventeenth aspects further comprises a piston movably provided in the cylinder bore. The operating member is movable relative to the base member between a rest position and an operated position. The piston is coupled to the operating member to be pulled in a pulling direction in response to a pulling movement of the operating member from the rest position to the operated position.

With the operating device according to the eighteenth aspect, it is possible to improve rigidity of the operating device in which the piston is pulled by the operating member.

In accordance with a nineteenth aspect of the present invention, the operating device according to any one of the first to eighteenth aspects is configured so that the mounting part includes a coupling portion to which an additional device is to be coupled.

With the operating device according to the nineteenth aspect, the coupling portion enables the additional device to be coupled to the mounting part.

In accordance with a twentieth aspect of the present invention, the operating device according to the nineteenth aspect is configured so that the coupling portion includes a coupling opening to which the additional device is to be coupled.

With the operating device according to the twentieth aspect, the coupling portion enables the additional device to be coupled to the mounting part with a simple structure.

BRIEF DESCRIPTION OF THE DRAWINGS

A more complete appreciation of the invention and many of the attendant advantages thereof will be readily obtained as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings.

FIG. **1** is a perspective view of an operating device for a human-powered vehicle.

FIG. **2** is a top view of the operating device illustrated in FIG. **1**.

FIG. **3** is a cross-sectional view of the operating device taken along line III-Ill of FIG. **2**.

FIG. **4** is a perspective view of the operating device and an additional device for the human-powered vehicle.

FIG. **5** is a cross-sectional view of the operating device taken along line V-V of FIG. **3**.

FIG. **6** is a cross-sectional view of the operating device taken along line VI-VI of FIG. **3**.

FIG. **7** is a cross-sectional view of the operating device taken along line VII-VII of FIG. **3**.

FIG. **8** is a side elevational view of the operating device illustrated in FIG. **1**.

FIG. **9** is a cross-sectional view of the operating device taken along line IX-IX of FIG. **3**.

FIG. **10** is a cross-sectional view of the operating device taken along line X-X of FIG. **3**.

FIG. **11** is a cross-sectional view of the operating device taken along line XI-XI of FIG. **9**.

FIG. **12** is an enlarged partial cross-sectional view of the operating device illustrated in FIG. **9**.

FIG. **13** is a cross-sectional view of the operating device taken along line XIII-XIII of FIG. **9**.

FIG. **14** is a graph showing a relationship between a position of a piton and a position of an operating member in the operating device illustrated in FIG. **1**.

DESCRIPTION OF THE EMBODIMENTS

The embodiment(s) will now be described with reference to the accompanying drawings, wherein like reference numerals designate corresponding or identical elements throughout the various drawings.

As seen in FIG. **1**, an operating device **10** for a human-powered vehicle **2** comprises a base member **12** and an operating member **14**. The base member **12** is configured to be mounted to the human-powered vehicle **2**. The operating member **14** is movably coupled to the base member **12**. In the present embodiment, the base member **12** is configured to be coupled to a vehicle body **2**A of the human-powered vehicle **2**. The base member **12** is configured to be coupled to a tubular part **2**B (e.g., a handlebar) of the vehicle body **2**A of the human-powered vehicle **2**. The tubular part **2**B has a longitudinal center axis **2**C. The tubular part **2**B extends along the longitudinal center axis **2**C. However, the base member **12** can be mounted to other parts of the human-powered vehicle **2** if needed and/or desired.

The operating device **10** is configured to be connected to an operated device **4** via a hydraulic hose **6**. However, the operating device **10** can be configured to be connected to other devices via members other than the hydraulic hose **6** if needed and/or desired.

In the present application, a human-powered vehicle is a vehicle to travel with a motive power including at least a human power of a user who rides the human-powered vehicle (i.e., rider). The human-powered vehicle includes a various kind of bicycles such as a mountain bike, a road bike, a city bike, a cargo bike, a hand bike, and a recumbent bike. Furthermore, the human-powered vehicle includes an electric bike (E-bike). The electric bike includes an electrically assisted bicycle configured to assist propulsion of a vehicle with an electric motor. However, a total number of wheels of the human-powered vehicle is not limited to two. For example, the human-powered vehicle includes a vehicle having one wheel or three or more wheels. Especially, the human-powered vehicle does not include a vehicle that uses only an internal-combustion engine as motive power. Generally, a light road vehicle, which includes a vehicle that does not require a driver's license for a public road, is assumed as the human-powered vehicle.

In the present application, the following directional terms "front," "rear," "forward," "rearward," "left," "right," "transverse," "upward" and "downward" as well as any other similar directional terms refer to those directions which are determined on the basis of a user (e.g., a rider) who is in the user's standard position (e.g., on a saddle or a seat) in the human-powered vehicle **2** with facing a handlebar or steering. Accordingly, these terms, as utilized to describe the operating device **10** or other components, should be interpreted relative to the human-powered vehicle **2** equipped with the operating device **10** or other components as used in an upright riding position on a horizontal surface.

In the present embodiment, the operating device **10** is a right-hand operating device configured to be operated by a user's right hand. However, structures of the operating device **10** can be applied to a left-hand operating device if needed and/or desired.

The base member **12** includes a base body **16** and a mounting part **18**. The mounting part **18** is configured to couple the base body **16** to the tubular part **2**B of the human-powered vehicle **2**. In the present embodiment, the mounting part **18** includes a clamp. However, the mounting part **18** can have structures other than the clamp if needed and/or desired.

As seen in FIG. **2**, the operating member **14** is movable relative to the base member **12** between a rest position P**11** and an operated position P**12**. In the present embodiment, the operating member **14** is pivotally coupled to the base member **12** about a pivot axis A**1**. The operating member **14** is pivotally coupled to the base body **16** about the pivot axis A**1**. The operating member **14** is pivotable relative to the base member **12** about the pivot axis A**1** between the rest

position P11 and the operated position P12. The operating member **14** is pivotable relative to the base body **16** about the pivot axis A1 between the rest position P11 and the operated position P12.

In the present application, the term "rest position" as used herein refers to a position at which a movable part such as the operating member **14** remains stationary in a state where the movable part is not operated by the user. The term "operated position" as used herein refers to a position at which the movable part has been operated by the user to perform an operation of a bicycle component such as the operated device **4**.

As seen in FIG. **3**, the mounting part **18** includes a mounting contact surface **20**. The mounting contact surface **20** is contactable with the tubular part **2**B of the human-powered vehicle **2** in a mounting state where the mounting part **18** couples the base body **16** to the tubular part **2**B of the human-powered vehicle **2**.

The mounting part **18** includes a mounting opening **22**. The mounting opening **22** has an opening center axis A2 defined along a longitudinal center axis **2**C of the tubular part **2**B of the human-powered vehicle **2** in the mounting state. The opening center axis A2 of the mounting opening **22** is coincident with the longitudinal center axis **2**C of the tubular part **2**B of the human-powered vehicle **2** in the mounting state.

The mounting part **18** includes a first mounting portion **24** and a second mounting portion **26**. The second mounting portion **26** is pivotally coupled to the first mounting portion **24** about a first mounting pivot axis A31. The mounting part **18** includes a third mounting portion **28**. The third mounting portion **28** is pivotally coupled to the second mounting portion **26** about a second mounting pivot axis A32. The mounting part **18** includes a fastener **29**. The fastener **29** is configured to fasten the third mounting portion **28** to the base body **16**.

In the present embodiment, at least part of the mounting part **18** is integrally provided with the base body **16** as a one-piece unitary member. In the present embodiment, the first mounting portion **24** is integrally provided with the base body **16** as a one-piece unitary member. The second mounting portion **26** is a separate member from the base body **16**, the first mounting portion **24**, and the third mounting portion **28**. The third mounting portion **28** is a separate member from the base body **16**, the first mounting portion **24**, and the second mounting portion **26**. However, the first mounting portion **24** can be a separate member from the base body **16** if needed and/or desired. The second mounting portion **26** can be integrally provided with at least one of the base body **16**, the first mounting portion **24**, and the third mounting portion **28** if needed and/or desired. The third mounting portion **28** can be integrally provided with at least one of the base body **16**, the first mounting portion **24**, and the second mounting portion **26** if needed and/or desired.

The mounting contact surface **20** is provided on at least one of the first mounting portion **24** and the second mounting portion **26**. The mounting contact surface **20** is provided to at least one of the first mounting portion **24**, the second mounting portion **26**, and the third mounting portion **28**.

In the present embodiment, the mounting contact surface **20** is provided to the first mounting portion **24**, the second mounting portion **26**, and the third mounting portion **28**. The mounting contact surface **20** includes a first mounting contact surface **20**A, a second mounting contact surface **20**B, and a third mounting contact surface **20**C. The first mounting contact surface **20**A is provided on the first mounting portion **24**. The second mounting contact surface **20**B is provided on the second mounting portion **26**. The third mounting contact surface **20**C is provided on the third mounting portion **28**. However, the mounting contact surface **20** can be provided to at least one of the first mounting portion **24**, the second mounting portion **26**, and the third mounting portion **28** if needed and/or desired. At least one of the first mounting contact surface **20**A, the second mounting contact surface **20**B, and the third mounting contact surface **20**C can be omitted from the mounting contact surface **20** if needed and/or desired.

As seen in FIG. **4**, the mounting part **18** includes a coupling portion **30** to which an additional device **8** is to be coupled. The coupling portion **30** includes a coupling opening **30**A to which the additional device **8** is to be coupled. The additional device **8** includes an additional body **8**A and an additional coupling part **8**B. The additional coupling part **8**B is configured to couple the additional body **8**A. The additional coupling part **8**B is configured to extend through the coupling opening **30**A. The additional coupling part **8**B is configured to adjustably couple the additional body **8**A to the coupling portion **30** of the mounting part **18** such that a positional relationship between the additional body **8**A and the mounting part **18** is adjustable within an adjustable range. The additional coupling part **8**B is configured to adjustably couple the additional body **8**A to the coupling portion **30** of the mounting part **18** such that a positional relationship between the additional body **8**A and the mounting part **18** is adjustable within the adjustable range in at least one of a first direction D11 and a second direction D12. The first direction D11 is defined along the longitudinal center axis **2**C of the tubular part **2**B of the human-powered vehicle **2**. The second direction D12 is defined in a circumferential direction about the longitudinal center axis **2**C of the tubular part **2**B of the human-powered vehicle **2**.

As seen in FIG. **5**, the base member **12** includes a first contact surface **32**. The first contact surface **32** is contactable with the tubular part **2**B of the human-powered vehicle **2** in the mounting state. The first contact surface **32** is spaced apart from the mounting contact surface **20** in an axial direction D2 with respect to the opening center axis A2.

The base member **12** includes a second contact surface **34**. The second contact surface **34** is contactable with the tubular part **2**B of the human-powered vehicle **2** in the mounting state. The second contact surface **34** is spaced apart from the mounting contact surface **20** and the first contact surface **32** in the axial direction D2. The mounting contact surface **20** is provided between the first contact surface **32** and the second contact surface **34** in the axial direction D2.

In the present embodiment, the first contact surface **32** is closer to the mounting contact surface **20** than the second contact surface **34** in the axial direction D2. The first contact surface **32** is closer to the first mounting contact surface **20**A than the second contact surface **34** in the axial direction D2. The mounting contact surface **20** is closer to the pivot axis A1 than the first contact surface **32** in the axial direction D2. The second contact surface **34** is closer to the pivot axis A1 than the first contact surface **32** in the axial direction D2. The second contact surface **34** is closer to the pivot axis A1 than mounting contact surface **20** in the axial direction D2. A first distance DS1 is defined between the first contact surface **32** and the mounting contact surface **20** in the axial direction D2. A second distance DS2 is defined between the second contact surface **34** and the mounting contact surface **20** in the axial direction D2. The first distance DS1 is shorter than the second distance DS2.

However, the positional relationships among the mounting contact surface **20**, the first contact surface **32**, the

second contact surface **34**, the pivot axis A**1** are not limited to the above relationship. The mounting contact surface **20** can be farther from the pivot axis A**1** than the first contact surface **32** in the axial direction D**2** if needed and/or desired. The first contact surface **32** can be farther from the mounting contact surface **20** than the second contact surface **34** in the axial direction D**2** if needed and/or desired. The first contact surface **32** can be farther from the first mounting contact surface **20**A than the second contact surface **34** in the axial direction D**2** if needed and/or desired. The first distance DS**1** can be longer than or equal to the second distance DS**2**.

The first contact surface **32** has a first axial length L**1** defined in the axial direction D**2**. The second contact surface **34** has a second axial length L**2** defined in the axial direction D**2**. The mounting contact surface **20** has an axial length L**3** defined in an axial direction D**2** with respect to the longitudinal center axis **2**C of the tubular part **2**B of the human-powered vehicle **2** in the mounting state.

In the present embodiment, the axial length L**3** of the mounting contact surface **20** is larger than at least one of the first axial length L**1** and the second axial length L**2**. The axial length L**3** of the mounting contact surface **20** is larger than the first axial length L**1** and the second axial length L**2**. The first axial length L**1** is larger than the second axial length L**2**. However, the first axial length L**1** can be smaller than or equal to the second axial length L**2** if needed and/or desired. The axial length L**3** can be smaller than or equal to at least one of the first axial length L**1** and the second axial length L**2** if needed and/or desired.

As seen in FIG. **6**, the base member **12** includes a first support **36**. The first support **36** includes the first contact surface **32**. The first support **36** extends from the base body **16** toward the tubular part **2**B of the human-powered vehicle **2** in the mounting state.

The base member **12** includes a second support **38**. The second support **38** includes the second contact surface **34**. The second support **38** extends from the base body **16** toward the tubular part **2**B of the human-powered vehicle **2** in the mounting state.

At least one of the first support **36** and the second support **38** is integrally provided with the base body **16** as a one-piece unitary member. In the present embodiment, the first support **36** and the second support **38** are integrally provided with the base body **16** as a one-piece unitary member. However, at least one of the first support **36** and the second support **38** can be a separate member from the base body **16** if needed and/or desired.

The base member **12** includes a cylinder bore **40**. The base body **16** includes the cylinder bore **40**. The cylinder bore **40** has a cylinder center axis A**3**. The cylinder bore **40** extends along the cylinder center axis A**3**. The operating device **10** for the human-powered vehicle **2** comprises a piston **42**. The piston **42** is movably provided in the cylinder bore **40**. The base member **12** and the piston **42** define a hydraulic chamber **44** in the cylinder bore **40**.

The piston **42** is coupled to the operating member **14** to be pulled in a pulling direction D**3** in response to a pulling movement of the operating member **14** from the rest position P**11** to the operated position P**12**. The piston **42** is movable relative to the base member **12** from an initial position P**21** to an actuated position P**22** in response to the pulling movement of the operating member **14**. In the present embodiment, the rest position P**11** of the operating member **14** corresponds to the initial position P**21** of the piston **42**. The operated position P**12** of the operating member **14** corresponds to the actuated position P**22** of the piston **42**.

The piston **42** includes a piston body **42**A, a first seal **42**B, and a second seal **42**C. The first seal **42**B and the second seal **42**C are attached to the piston body **42**A. The base member **12**, the piston body **42**A, and the first seal **42**B define the hydraulic chamber **44** in the cylinder bore **40**. An intermediate space **45** is defined between the first seal **42**B and the second seal **42**C in the cylinder bore **40**.

The operating device **10** includes a piston biasing member **46**. The piston biasing member **46** is provided in the hydraulic chamber **44** to bias the piston **42** toward the initial position P**21**.

The cylinder bore **40** includes a first end **40**A and a second end **40**B. The second end **40**B is closer to the operating member **14** than the first end **40**A. The base member **12** includes a cylinder lid **47**. The cylinder lid **47** is attached to the base body **16** to close the first end **40**A of the cylinder bore **40**. The cylinder center axis A**3** extends along the longitudinal center axis **2**C of the tubular part **2**B of the human-powered vehicle **2** in a mounting state where the base member **12** is mounted to the tubular part **2**B of the human-powered vehicle **2**.

The cylinder center axis A**3** is inclined toward the longitudinal center axis **2**C of the tubular part **2**B of the human-powered vehicle **2** so that the first end **40**A is closer to the tubular part **2**B of the human-powered vehicle **2** than the second end **40**B in the mounting state where the base member **12** is mounted to the tubular part **2**B of the human-powered vehicle **2**. However, the cylinder center axis A**3** can be parallel to the longitudinal center axis **2**C of the tubular part **2**B of the human-powered vehicle **2** if needed and/or desired.

The base member **12** includes a hose-attachment hole **48**. The hose-attachment hole **48** is configured to be detachably connected with the hydraulic hose **6**. The hose-attachment hole **48** is configured to be detachably non-pivotally connected with the hydraulic hose **6**. The hose-attachment hole **48** is configured to be in communication with the hydraulic chamber **44**.

In the present embodiment, the hose-attachment hole **48** is provided closer to the longitudinal center axis **2**C of the tubular part **2**B of the human-powered vehicle **2** than the cylinder bore **40** in a mounting state where the base member **12** is mounted to the tubular part **2**B of the human-powered vehicle **2**. The hose-attachment hole **48** is provided between the cylinder bore **40** and the tubular part **2**B of the human-powered vehicle **2** in the mounting state.

However, the hose-attachment hole **48** can be provided closer to the cylinder bore **40** than the longitudinal center axis **2**C of the tubular part **2**B of the human-powered vehicle **2** in the mounting state where the base member **12** is mounted to the tubular part **2**B of the human-powered vehicle **2** if needed and/or desired. The cylinder bore **40** can be provided between the hose-attachment hole **48** and the tubular part **2**B of the human-powered vehicle **2** in the mounting state if needed and/or desired.

The hose-attachment hole **48** has a hole center axis A**4** and extends along the hole center axis A**4**. The hydraulic hose **6** extends along the hole center axis A**4** of the hose-attachment hole **48** in a state where the hydraulic hose **6** is attached to the hose-attachment hole **48**. In the present embodiment, the hole center axis A**4** of the hose-attachment hole **48** is defined along the cylinder center axis A**3**. The hole center axis A**4** of the hose-attachment hole **48** is defined to be parallel to the cylinder center axis A**3**. However, the hole center axis A**4** of the hose-attachment hole **48** can be non-parallel to the cylinder center axis A**3** if needed and/or desired.

The base member **12** includes a hose-attachment structure **49**. The hose-attachment structure **49** includes at least part of the hose-attachment hole **48**. The base body **16** includes an attachment hole **16**A. The hose-attachment structure **49** is attached to the attachment hole **16**A. The hose-attachment structure **49** is configured to detachably connect the hydraulic hose **6** to the base body **16**.

The hose-attachment structure **49** includes a sleeve **49**A and a tubular bushing **49**B. The sleeve **49**A includes an external thread **49**C. The attachment hole **16**A includes a threaded hole **16**B. The external thread **49**C of the sleeve **49**A is threadedly engaged with the threaded hole **16**B. The sleeve **49**A and the tubular bushing **49**B are provided in the attachment hole **16**A in a state where the hydraulic hose **6** is attached to the hose-attachment hole **48**. The tubular bushing **49**B can also be referred to as an olive.

Tightening the sleeve **49**A deforms the tubular bushing **49**B to decrease an inner diameter of the tubular bushing **49**B, attaching firmly the tubular bushing **49**B to the hydraulic hose **6**. Thus, the hydraulic hose **6** is firmly connected to the hose-attachment hole **48**.

The base member **12** includes an intermediate hole **50**. The intermediate hole **50** extends from the cylinder bore **40** toward the tubular part **2**B of the human-powered vehicle **2** in the mounting state. The intermediate hole **50** is configured to be in communication with the hydraulic chamber **44**. The intermediate hole **50** extends from the cylinder bore **40** toward the first contact surface **32**. The intermediate hole **50** is at least partially provided in the first support **36**. The intermediate hole **50** includes an end opening **50**A provided on the first contact surface **32**. The intermediate hole **50** extends from the cylinder bore **40** to the end opening **50**A. In the present embodiment, the intermediate hole **50** is partially provided in the first support **36**. However, the intermediate hole **50** can be entirely provided in the first support **36**.

The base member **12** includes a seal member **52**. The seal member **52** is provided in the intermediate hole **50** to close the intermediate hole **50**. The seal member **52** is provided between the cylinder bore **40** and the end opening **50**A. The seal member **52** is a separate member from the base body **16**. The seal member **52** includes an external thread **52**A. The intermediate hole **50** includes a threaded hole **50**B. The external thread **52**A of the seal member **52** is engaged with the threaded hole **50**B of the intermediate hole **50**. However, the seal member **52** can be integrally provided with the base body **16** as a one-piece unitary member if needed and/or desired.

The hose-attachment hole **48** is configured to be in communication with the intermediate hole **50**. The hose-attachment hole **48** includes an outlet end opening **48**A. The hose-attachment hole **48** extends from the intermediate hole **50** to the outlet end opening **48**A along the cylinder center axis A**3**. The hose-attachment hole **48** extends from the outlet end opening **48**A to the intermediate hole **50** in the pulling direction D**3**. The hose-attachment hole **48** extends from the intermediate hole **50** along the cylinder center axis A**3**. The hose-attachment hole **48** extends from the intermediate hole **50** along the axial direction D**2**. The hose-attachment hole **48** extends from the intermediate hole **50** away from the mounting contact surface **20** along the axial direction D**2**. However, the positional relationships among the hose-attachment hole **48**, the intermediate hole **50**, the mounting contact surface **20** are not limited to the above positional relationship.

The intermediate hole **50** has a longitudinal axis A**5**. The longitudinal axis A**5** of the intermediate hole **50** is non-parallel to the hole center axis A**4** of the hose-attachment hole **48**. The longitudinal axis A**5** of the intermediate hole **50** intersects with the hole center axis A**4** of the hose-attachment hole **48**. The longitudinal axis A**5** of the intermediate hole **50** is perpendicular to the hole center axis A**4** of the hose-attachment hole **48**. However, the longitudinal axis A**5** of the intermediate hole **50** can be non-perpendicular to the hole center axis A**4** of the hose-attachment hole **48**.

As seen in FIG. **7**, the operating device **10** further comprises a reservoir **56**. The reservoir **56** includes a reservoir chamber **58**. The reservoir chamber **58** is configured to be in communication with the hydraulic chamber **44**. The base member **12** includes a reservoir recess **60** including a recess end opening **60**A. The reservoir recess **60** has a longitudinal axis A**6** and extends along the longitudinal axis A**6**. The longitudinal axis A**6** of the reservoir recess **60** is non-parallel to the cylinder center axis A**3**. The longitudinal axis A**6** of the reservoir recess **60** is inclined relative to the cylinder center axis A**3**. The longitudinal axis A**6** of the reservoir recess **60** intersects with the cylinder center axis A**3** to define an imaginary plane. The longitudinal axis A**6** of the reservoir recess **60** is not provided in a skew position with respect to the cylinder center axis A**3**. However, the longitudinal axis A**6** of the reservoir recess **60** can be parallel to the cylinder center axis A**3** if needed and/or desired. The longitudinal axis A**6** of the reservoir recess **60** can be provided in a skew position with respect to the cylinder center axis A**3** if needed and/or desired.

The reservoir **56** includes a diaphragm **62** and a lid **64**. The diaphragm **62** is provided in the reservoir recess **60**. The diaphragm **62** is made of an elastic material such as elastomer (e.g., rubber). The lid **64** is attached to the base member **12** to close the end opening **50**A. The diaphragm **62** is held between the base member **12** and the lid in a state where the lid is attached to the base member **12**. The base member **12** and the diaphragm **62** define the reservoir chamber **58**.

The base body **16** includes an intermediate passageway **65**. The intermediate passageway **65** is configured to connect the hydraulic chamber **44** to the reservoir chamber **58**. The intermediate passageway **65** includes a first hole **65**A, a second hole **65**B, a primary port **65**C, and a secondary port **65**D. The first hole **65**A connects the reservoir chamber **58** to the second hole **65**B. The primary port **65**C connects the second hole **65**B to the cylinder bore **40**. The secondary port **65**D connects the second hole **65**B to the cylinder bore **40**.

The primary port **65**C is configured to be connected to the hydraulic chamber **44** in an initial state where the piston is in the initial position P**21**. The secondary port **65**D is configured not to be connected to the hydraulic chamber **44** in the initial state.

The first seal **42**B is provided between the primary port **65**C and the secondary port **65**D in the initial state. The secondary port **65**D is provided between the first seal **42**B and the second seal **42**C in the initial state. Thus, the reservoir chamber **58** is in communication with the hydraulic chamber **44** and the intermediate space **45** in the initial state so as to absorb a change in pressure in the hydraulic chamber **44**.

The piston **42** is movable relative to the base member **12** from the initial position P**21** toward the actuated position P**22** through an intermediate position P**23**. The initial position P**21** is closer to the intermediate position P**23** than the actuated position P**22**. The first seal **42**B is configured to interrupt the connection between the hydraulic chamber **44** and the primary port **65**C in an intermediate state where the piston **42** is in the intermediate position P**23**. Thus, the hydraulic chamber **44** is not in communication with the

reservoir chamber **58** and the intermediate space **45** to supply a hydraulic pressure in a state where the piston **42** is in a position between the intermediate position P**23** and the actuated position P**22**.

As seen in FIG. **8**, the hole center axis A**4** of the hose-attachment hole **48** is offset, as viewed along the cylinder center axis A**3**, from a reference line RL**1** extending through the cylinder center axis A**3** and the longitudinal center axis **2**C of the tubular part **2**B of the human-powered vehicle **2** in the mounting state.

The reservoir **56** is provided on a first side S**1** of the reference line RL**1** as viewed along the cylinder center axis A**3** in the mounting state. The hole center axis A**4** of the hose-attachment hole **48** is provided on the first side S**1** of the reference line RL**1** as viewed along the cylinder center axis A**3** in the mounting state. As indicated with a long-dushed double-dotted line in FIG. **8**, however, the hole center axis A**4** of the hose-attachment hole **48** is provided on a second side S**2** of the reference line RL**1** as viewed along the cylinder center axis A**3** in the mounting state. The second side S**2** is provided on an opposite side of the first side S**1** with respect to the reference line RL**1** as viewed along the cylinder center axis A**3** in the mounting state.

The hose-attachment hole **48** is provided between the reservoir **56** and the tubular part **2**B of the human-powered vehicle **2** as viewed along the cylinder center axis A**3** in the mounting state. The reservoir **56** is provided above the reference line RL**1** as viewed along the cylinder center axis A**3** in the mounting state. However, the reservoir **56** can be provided on or below the reference line RL**1** if needed and/or desired.

As seen in FIG. **2**, the longitudinal axis A**6** of the reservoir recess **60** is at least partially provided between the cylinder center axis A**3** and the hole center axis A**4** as viewed along the pivot axis A**1**. The longitudinal axis of the reservoir recess **60** is inclined relative to the cylinder center axis A**3** and the hole center axis A**4** as viewed along the pivot axis A**1**.

As seen in FIG. **9**, the operating device **10** for the human-powered vehicle **2** comprises a coupling structure **70**. The coupling structure **70** is configured to couple the operating member **14** to the piston **42** to transmit the pulling movement to the piston **42**.

The operating member **14** includes a cam surface **72**. The coupling structure **70** includes a follower **74**. The follower **74** is configured to be in contact with the cam surface **72** to receive the pulling movement.

The base member **12** includes a guide groove **76**. The coupling structure **70** includes a guided part **78**. The guided part **78** is movably provided in the guide groove **76** to move the follower **74** in the pulling direction D**3**. The guide groove **76** linearly extends in the pulling direction D**3**. The base member **12** includes a first guide surface **80** and a second guide surface **82**. The first guide surface **80** and the second guide surface **82** define the guide groove **76**. The first guide surface **80** linearly extends in the pulling direction D**3**. The second guide surface **82** linearly extends in the pulling direction D**3**. The guided part **78** is provided between the first guide surface **80** and the second guide surface **82**. The guided part **78** is contactable with the first guide surface **80** and the second guide surface **82**.

As seen in FIG. **10**, the base member **12** includes a guide groove **86**. The coupling structure **70** includes a guided part **88**. The guided part **88** is movably provided in the guide groove **86** to move the follower **74** in the pulling direction D**3**. The guide groove **86** linearly extends in the pulling direction D**3**. The base member **12** includes a first guide surface **90** and a second guide surface **92**. The first guide surface **90** and the second guide surface **92** define the guide groove **86**. The first guide surface **90** linearly extends in the pulling direction D**3**. The second guide surface **92** linearly extends in the pulling direction D**3**. The guided part **88** is provided between the first guide surface **90** and the second guide surface **92**. The guided part **88** is contactable with the first guide surface **90** and the second guide surface **92**.

As seen in FIG. **11**, at least one of the follower **74** and the guided part **78** and/or **88** is rotatably coupled to the piston **42** about a rotational axis A**7**. The follower **74** and the guided parts **78** and **88** are rotatably coupled to the piston **42** about the rotational axis A**7**. The coupling structure **70** includes a support pin **94**. The support pin **94** is configured to rotatably support the at least one of the follower **74** and the guided part **78** and/or **88** about the rotational axis A**7**.

In the present embodiment, the support pin **94** is configured to rotatably support the follower **74** and the guided parts **78** and **88** about the rotational axis A**7**. The support pin **94** includes a first pin end **94**A and a second pin end **94**B. The support pin **94** extends along the rotational axis A**7** between the first pin end **94**A and the second pin end **94**B. The guided part **78** is configured to be rotatably support by the first pin end **94**A. The guided part **78** is configured to be rotatably support by the second pin end **94**B. The guided part **78** is spaced apart from the guided part **78**. The follower **74** is provided between the guided parts **78** and **88**.

The coupling structure **70** includes an intermediate member **96**. The intermediate member **96** is pivotally coupled to the piston **42** about a piston pivot axis A**8**. The coupling structure **70** includes a coupling pin **98**. The coupling pin **98** is configured to pivotally couple the intermediate member **96** to the piston **42** about the piston pivot axis A**8**.

At least one of the follower **74** and the guided part **78** and/or **88** is rotatably coupled to the intermediate member **96** about the rotational axis A**7**. The follower **74** and the guided parts **78** and **88** are rotatably coupled to the intermediate member **96** about the rotational axis A**7**. However, at least one of the follower **74** and the guided parts can be rotatably coupled to the intermediate member **96** about the rotational axis A**7** if needed and/or desired.

The intermediate member **96** includes a first part **100** and a second part **102**. The first part **100** includes a first hole **100**A. The second part **102** includes a second hole **102**A. The support pin **94** extends through the first hole **100**A and the second hole **102**A. The first part **100** is spaced apart from the second part **102**. The follower **74** is provided between the first part **100** and the second part **102**. The first part **100**, the follower **74**, and the second part **102** are provided between the guided parts **78** and **88**.

As seen in FIG. **9**, the intermediate member **96** includes a first coupling part **104** and a second coupling part **106**. The first coupling part **104** includes a first coupling hole **104**A. The second coupling part **106** includes a second coupling hole **106**A. The piston **42** includes a third coupling hole **42**D. The coupling pin **98** extends through the first coupling hole **104**A, the second coupling hole **106**A, and the third coupling hole **42**D.

The piston pivot axis A**8** intersects with the cylinder center axis A**3** as viewed along the rotational axis A**7**. In the present embodiment, the piston pivot axis A**8** is perpendicular to the cylinder center axis A**3** as viewed along the rotational axis A**7**. However, the piston pivot axis A**8** can be non-perpendicular to the cylinder center axis A**3** as viewed along the rotational axis A**7** if needed and/or desired.

As seen in FIGS. **9** and **10**, at least one of the follower **74** and the guided part **78** and/or **88** is provided to overlap with

the cylinder center axis A3 as viewed along the rotational axis A7. In the present embodiment, the follower **74** and the guided parts **78** and **88** are provided to overlap with the cylinder center axis A3 as viewed along the rotational axis A7. However, at least one of the follower **74** and the guided parts **78** and **88** can be offset from the cylinder center axis A3 as viewed along the rotational axis A7 if needed and/or desired.

As seen in FIG. **12**, the coupling structure **70** includes a plurality of rollers **108** and a retainer **110**. The plurality of rollers **108** and the retainer **110** are provided between the follower **74** and the support pin **94**. The retainer **110** is configured to rotatably support the plurality of rollers **108**.

The cam surface **72** includes a curved surface **72**A. The curved surface **72**A is contactable with the follower **74**. The curved surface **72**A has a curved convex shape as viewed along the rotational axis A7. The operating member **14** includes a cam groove **112**. The cam surface **72** partially defines the cam groove **112**. The follower **74** is movably provided in the cam groove **112**. The operating member **14** includes an additional cam surface **114**. The additional cam surface **114** is contactable with the follower **74**. The cam surface **72** and the additional cam surface **114** at least partially define the cam groove **112**. The cam groove **112** is provided between the cam surface **72** and the additional cam surface **114**.

The curved surface **72**A has the curved convex such that the curved surface **72**A approaches the additional cam surface **114**. The curved surface **72**A has the curved shape such that the curved surface **72**A protrudes in the pulling direction D3.

The cam surface **72** includes a flat surface **72**B. The flat surface **72**B is contactable with the follower **74**. The flat surface **72**B is continuously connected with the curved surface **72**A.

The additional cam surface **114** includes an additional curved surface **114**A as viewed along the rotational axis A7. However, the additional cam surface **114** can include surfaces having other shapes such as a flat shape.

The cam groove **112** includes a first closed end **112**A and a second closed end **112**B. The operating member **14** includes a first end surface **116** and a second end surface **118**. The first end surface **116** defines the first closed end **112**A. The second end surface **118** defines the second closed end **112**B. The cam surface **72**, the additional cam surface **114**, the first end surface **116**, and the second end surface **118** define the cam groove **112**. At least one of the first end surface **116** and the second end surface **118** can be omitted from the operating member **14** if needed and/or desired. At least one of the first closed end **112**A and the second closed end **112**B can be omitted from the cam groove **112** if needed and/or desired.

In the present embodiment, the first end surface **116** is closer to the curved surface **72**A of the cam surface **72** than the second end surface **118**. The first end surface **116** is closer to the follower **74** than the second end surface **118** in a rest state where the operating member **14** is in the rest position P11. The follower **74** is in contact with the curved surface **72**A of the cam surface **72** in the rest state where the operating member **14** is in the rest position P11.

The cam groove **112** has a width W1. The follower **74** has an outer diameter DM1. In the present embodiment, the width W1 of the cam groove **112** is larger than the outer diameter DM1 of the follower **74**. A clearance CL is provided between the additional cam surface **114** and the follower **74**. The clearance CL is smaller than or equal to a predetermined clearance. However, the width W1 of the cam surface **72** can be equal to the outer diameter DM1 of the follower **74** if needed and/or desired. The clearance CL can be larger than the predetermined clearance or can be equal to zero.

As seen in FIG. **9**, the operating member **14** includes a first operating member **120**, a second operating member **122**, and an adjustment structure **124**. The first operating member **120** is pivotally coupled to the base member **12** about the pivot axis A1. The second operating member **122** is pivotally coupled to the base member **12** and the first operating member **120** about the pivot axis A1.

The adjustment structure **124** is configured to change a relative position between the first operating member **120** and the second operating member **122** about the pivot axis A1. The adjustment structure **124** includes an adjustment bolt **126** and an adjustment nut **128**. The adjustment bolt **126** is rotatably attached to the second operating member **122**. The adjustment nut **128** is pivotally attached to the first operating member **120**. The adjustment nut **128** includes a threaded hole **128**A. The adjustment bolt **126** includes an external thread **126**A configured to be threadedly engaged with the threaded hole **128**A. Rotation of the adjustment bolt **126** changes the relative position between the first operating member **120** and the second operating member **122** about the pivot axis A1. Thus, the adjustment structure **124** is configured to change the rest position P11 of the operating member **14** relative to the base member **12**.

As seen in FIG. **13**, the operating device **10** comprises a first biasing member **130** and a second biasing member **132**. The first biasing member **130** is configured to bias one of the first operating member **120** and the second operating member **122** relative to the base member **12** about the pivot axis A1 toward the operated position P12 (see e.g., FIG. **9**). biasing force of the first biasing member **130** is smaller than a biasing force of the piston biasing member **46** (see e.g., FIG. **6**). Thus, the biasing force of the first biasing member **130** presses the cam surface **72** against the follower **74** without moving the piston **42** toward the actuated position P22 (see e.g., FIG. **9**). The second biasing member **132** is configured to bias the first operating member **120** relative to the second operating member **122** about the pivot axis A1. A biasing force of the second biasing member **132** can stabilize the relative position between the first operating member **120** and the second operating member **122**.

As seen in FIG. **14**, the cam surface **72** is configured to change a travel distance TD of the piston **42** per unit amount PM of the pulling movement of the operating member **14**. The cam surface **72** is configured to change the travel distance TD of the piston **42** per unit amount PM of a pivotal movement of the operating member **14** about the pivot axis A1. The cam surface **72** is configured to change the travel distance TD of the piston **42** per unit amount PM of a pivot angle of the operating member **14** about the pivot axis A1.

The piston **42** has a movable range MR defined between the initial position P21 and the actuated position P22. The movable range MR of the piston **42** includes a first movable range MR1 and a second movable range MR2. The first movable range MR1 is closer to the initial position P21 than the second movable range MR2. The second movable range MR2 is closer to the actuated position P22 than the first movable range MR1. The first movable range MR1 has a distance equal to a distance of the second movable range MR2.

As seen in FIGS. **6** and **14**, the cam surface **72** is configured to move the piston **42** by a first travel distance TD1 per unit amount PM of the pulling movement of the operating member **14** in the first movable range MR1. The

cam surface **72** is configured to move the piston **42** by a second travel distance TD**2** per unit amount PM of the pulling movement of the operating member **14** in the second movable range MR**2**. The first travel distance TD**1** is different from the second travel distance TD**2**. In the present embodiment, the first travel distance TD**1** is longer than the second travel distance TD**2**. However, the first travel distance TD**1** can be smaller than or equal to the second travel distance TD**2** if needed and/or desired.

As seen in FIG. **6**, the rotational axis A**7** is movable to not pass through a first reference plane RP**1** perpendicular to the cylinder center axis A**3**. The first reference plane RP**1** extends through the pivot axis A**1** of the operating member **14**. The follower **74** is movable to not pass through the first reference plane RP**1**. The rotational axis A**7** is movable only within a region RG defined by the first reference plane RP**1** and a second reference plane RP**2** perpendicular to the first reference plane RP**1**. The second reference plane RP**2** extends through the pivot axis A**1** of the operating member **14**. The follower **74** is movable only within the region RG. The cylinder bore **40** is provided in the region RG.

However, the follower **74** can be configured to pass through the first reference plane RP**1** if needed and/or desired. The rotational axis A**7** can be movable outside the region RG if needed and/or desired. The follower **74** can be movable outside the region RG if needed and/or desired.

As seen in FIG. **2**, a first rotational force F**11** is applied to the base member **12** about the mounting part **18** when a first force F**12** is applied to the operating member **14**. The first contact surface **32** comes into contact with the tubular part **2**B of the human-powered vehicle **2** when the first rotational force F**11** is applied to the base member **12**. Thus, the first contact surface **32** can reduce influence caused by the first force F**12** applied to the operating member **14**.

A second rotational force F**21** is applied to the base member **12** about the mounting part **18** when a second force F**22** is applied to the operating member **14**. The second contact surface **34** comes into contact with the tubular part **2**B of the human-powered vehicle **2** when the second rotational force F**21** is applied to the base member **12**. Thus, the second contact surface **34** can reduce influence caused by the second force F**22** applied to the operating member **14**.

In the present application, the term "comprising" and its derivatives, as used herein, are intended to be open ended terms that specify the presence of the stated features, elements, components, groups, integers, and/or steps, but do not exclude the presence of other unstated features, elements, components, groups, integers and/or steps. This concept also applies to words of similar meaning, for example, the terms "have," "include" and their derivatives.

The terms "member," "section," "portion," "part," "element," "body" and "structure" when used in the singular can have the dual meaning of a single part or a plurality of parts.

The ordinal numbers such as "first" and "second" recited in the present application are merely identifiers, but do not have any other meanings, for example, a particular order and the like. Moreover, for example, the term "first element" itself does not imply an existence of "second element," and the term "second element" itself does not imply an existence of "first element."

The term "pair of," as used herein, can encompass the configuration in which the pair of elements have different shapes or structures from each other in addition to the configuration in which the pair of elements have the same shapes or structures as each other.

The terms "a" (or "an"), "one or more" and "at least one" can be used interchangeably herein.

The phrase "at least one of" as used in this disclosure means "one or more" of a desired choice. For one example, the phrase "at least one of" as used in this disclosure means "only one single choice" or "both of two choices" if the number of its choices is two. For other example, the phrase "at least one of" as used in this disclosure means "only one single choice" or "any combination of equal to or more than two choices" if the number of its choices is equal to or more than three. For instance, the phrase "at least one of A and B" encompasses (1) A alone, (2), B alone, and (3) both A and B. The phrase "at least one of A, B, and C" encompasses (1) A alone, (2), B alone, (3) C alone, (4) both A and B, (5) both B and C, (6) both A and C, and (7) all A, B, and C. In other words, the phrase "at least one of A and B" does not mean "at least one of A and at least one of B" in this disclosure.

Finally, terms of degree such as "substantially," "about" and "approximately" as used herein mean a reasonable amount of deviation of the modified term such that the end result is not significantly changed. All of numerical values described in the present application can be construed as including the terms such as "substantially," "about" and "approximately."

Obviously, numerous modifications and variations of the present invention are possible in light of the above teachings. It is therefore to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described herein.

What is claimed is:

1. An operating device for a human-powered vehicle, comprising:

a base member including

a base body, and

a mounting part configured to couple the base body to a tubular part of the human-powered vehicle, at least part of the mounting part being integrally provided with the base body as a one-piece unitary member; and

an operating member movably coupled to the base body,

the mounting part including a mounting contact surface contactable with the tubular part of the human-powered vehicle in a mounting state where the mounting part couples the base body to the tubular part of the human-powered vehicle, the mounting part including a mounting opening having an opening center axis defined along a longitudinal center axis of the tubular part of the human-powered vehicle in the mounting state,

the base member including

a first contact surface contactable with the tubular part of the human-powered vehicle in the mounting state, the first contact surface being spaced apart from the mounting contact surface in an axial direction with respect to the opening center axis, and

a second contact surface contactable with the tubular part of the human-powered vehicle in the mounting state, the second contact surface being spaced apart from the mounting contact surface and the first contact surface in the axial direction, and

the mounting contact surface being provided between the first contact surface and the second contact surface in the axial direction.

2. The operating device according to claim **1**, wherein

the base member includes

a cylinder bore, and

an intermediate hole extending from the cylinder bore toward the first contact surface.

3. The operating device according to claim 2, wherein
the base member includes a first support including the first contact surface, the first support extending from the base body toward the tubular part of the human-powered vehicle in the mounting state, and
the intermediate hole is at least partially provided in the first support.

4. The operating device according to claim 2, wherein
the intermediate hole includes an end opening provided on the first contact surface and extends from the cylinder bore to the end opening.

5. The operating device according to claim 4, wherein
the base member includes a seal member provided in the intermediate hole to close the intermediate hole.

6. The operating device according to claim 5, wherein
the seal member is provided between the cylinder bore and the end opening.

7. The operating device according to claim 2, wherein
the base member includes a hose-attachment hole configured to be detachably connected with a hydraulic hose, and
the hose-attachment hole is configured to be in communication with the intermediate hole.

8. The operating device according to claim 7, wherein
the cylinder bore has a cylinder center axis and extends the cylinder center axis, and
the hose-attachment hole extends from the intermediate hole along the cylinder center axis.

9. The operating device according to claim 7, wherein
the hose-attachment hole extends from the intermediate hole along the axial direction.

10. The operating device according to claim 7, wherein
the hose-attachment hole extends from the intermediate hole away from the mounting contact surface along the axial direction.

11. The operating device according to claim 2, further comprising
a piston movably provided in the cylinder bore, wherein
the operating member is movable relative to the base member between a rest position and an operated position, and
the piston is coupled to the operating member to be pulled in a pulling direction in response to a pulling movement of the operating member from the rest position to the operated position.

12. The operating device according to claim 1, wherein
the base member includes
a first support including the first contact surface, the first support extending from the base body toward the tubular part of the human-powered vehicle in the mounting state, and
a second support including the second contact surface, the second support extending from the base body toward the tubular part of the human-powered vehicle in the mounting state.

13. The operating device according to claim 12, wherein
at least one of the first support and the second support is integrally provided with the base body as a one-piece unitary member.

14. The operating device according to claim 1, wherein
the mounting part includes a first mounting portion and a second mounting portion,
the first mounting portion is integrally provided with the base body as a one-piece unitary member,
the second mounting portion is pivotally coupled to the first mounting portion about a first mounting pivot axis, and
the mounting contact surface is provided on at least one of the first mounting portion and the second mounting portion.

15. The operating device according to claim 14, wherein
the mounting part includes a third mounting portion pivotally coupled to the second mounting portion about a second mounting pivot axis, and
the mounting contact surface is provided to at least one of the first mounting portion, the second mounting portion, and the third mounting portion.

16. The operating device according to claim 1, wherein
the mounting part includes a coupling portion to which an additional device is to be coupled.

17. The operating device according to claim 16, wherein
the coupling portion includes a coupling opening to which the additional device is to be coupled.

18. The operating device according to claim 1, wherein
the first contact surface is spaced apart from the mounting contact surface by a first distance to form a gap between the first contact surface and the mounting contact surface in the axial direction.

19. An operating device for a human-powered vehicle, comprising:
a base member including
a base body, and
a mounting part configured to couple the base body to a tubular part of the human-powered vehicle; and
an operating member movably coupled to the base member,
the mounting part including a mounting contact surface contactable with the tubular part of the human-powered vehicle in a mounting state where the mounting part couples the base body to the tubular part of the human-powered vehicle, the mounting part including a mounting opening having an opening center axis defined along a longitudinal center axis of the tubular part of the human-powered vehicle in the mounting state,
the base member including
a first contact surface contactable with the tubular part of the human-powered vehicle in the mounting state, the first contact surface being spaced apart from the mounting contact surface in an axial direction with respect to the opening center axis,
a cylinder bore, and
an intermediate hole extending from the cylinder bore toward the first contact surface.

20. An operating device for a human-powered vehicle, comprising:
a base member including
a base body, and
a mounting part configured to couple the base body to a tubular part of the human-powered vehicle, at least part of the mounting part being integrally provided with the base body as a one-piece unitary member; and
an operating member movably coupled to the base member,
the mounting part including a mounting contact surface contactable with the tubular part of the human-powered vehicle in a mounting state where the mounting part couples the base body to the tubular part of the human-powered vehicle, the mounting part including a mounting opening having an opening center axis defined along a longitudinal center axis of the tubular part of the human-powered vehicle in the mounting state,

the base member including

a first contact surface contactable with the tubular part of the human-powered vehicle in the mounting state, the first contact surface being spaced apart from the mounting contact surface in an axial direction with respect to the opening center axis, and

a second contact surface contactable with the tubular part of the human-powered vehicle in the mounting state, the second contact surface being spaced apart from the mounting contact surface and the first contact surface in the axial direction, and

the mounting contact surface being provided between the first contact surface and the second contact surface in the axial direction, wherein

the first contact surface is closer to the mounting contact surface than the second contact surface in the axial direction.

21. An operating device for a human-powered vehicle, comprising:

a base member including

a base body, and

a mounting part configured to couple the base body to a tubular part of the human-powered vehicle, at least part of the mounting part being integrally provided with the base body as a one-piece unitary member; and

an operating member movably coupled to the base member,

the mounting part including a mounting contact surface contactable with the tubular part of the human-powered vehicle in a mounting state where the mounting part couples the base body to the tubular part of the human-powered vehicle, the mounting part including a mounting opening having an opening center axis defined along a longitudinal center axis of the tubular part of the human-powered vehicle in the mounting state,

the base member including

a first contact surface contactable with the tubular part of the human-powered vehicle in the mounting state, the first contact surface being spaced apart from the mounting contact surface in an axial direction with respect to the opening center axis, and

a second contact surface contactable with the tubular part of the human-powered vehicle in the mounting state, the second contact surface being spaced apart from the mounting contact surface and the first contact surface in the axial direction, and

the mounting contact surface being provided between the first contact surface and the second contact surface in the axial direction, wherein

the operating member is pivotally coupled to the base body about a pivot axis, and

the mounting contact surface is closer to the pivot axis than the first contact surface in the axial direction.

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